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NO. 180

SPACE FLIGHT OPERATIONS PLAN

SURVEYOR

MISSION A

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14804

## FOREWORD

It is the function of the Space Flight Operations Plan to define the method by which space flight operations will be conducted in both the standard case and in anticipated departures from the standard case. Space flight operations are defined as the operations necessary for obtaining and processing spacecraft information and for determining and executing spacecraft commands from launch to the accomplishment of the mission. This Space Flight Operations Plan covers the requirements for Surveyor Mission A. Operational facilities and support equipment are described and the flow of data between facilities is outlined. Required sequences and procedures are specified for the standard case and for certain nonstandard situations.



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SECTION I

SPACE FLIGHT OPERATIONS

A. MISSION OBJECTIVES

TO BE SUPPLIED AT A LATER DATE.

## B. LAUNCH VEHICLE AND SPACECRAFT DESCRIPTIONS

### 1. Launch Vehicle

A two-stage launch vehicle, consisting of an Atlas D first stage and a Centaur second stage, will boost the spacecraft in a direct ascent, powered flight path into the required lunar trajectory (see Figure I-1).

The Atlas propulsion system consists of twin booster engines, a single sustainer engine, and two vernier engines for attitude and velocity corrections. All engines are gimbal-mounted. Guidance will be from an autopilot controlled from the Centaur inertial guidance system.

The Centaur system is driven by two gimbal-mounted, liquid-hydrogen engines that provide 15,000 pounds of thrust each. Flight control for the Centaur is supplied by an inertial guidance system that also controls the autopilot for the first stage.

The first stage telemetry system transmits functional and environmental data on a VHF carrier. The second-stage telemetry system transmits both Centaur and spacecraft data on a VHF carrier. The Centaur carries a C-band beacon to permit ground tracking.

### 2. Spacecraft

The Surveyor spacecraft has a nominal weight of 2100 pounds and is designed to be mounted within an aerodynamic nose fairing atop the Atlas/Centaur launch vehicle. Three extendable legs provide a broad base for touchdown stability (see Figure I-2).

The Surveyor spacecraft structure provides mechanical support and a base for the various spacecraft subsystems.

The spacecraft has a guidance system that can maintain full attitude stabilization and that can direct the spacecraft through maneuvers in attitude and trajectory in response to commands from the ground. Cold gas jets position the spacecraft in the required attitude. In the optically stabilized mode, the spacecraft uses the Sun and Canopus as reference objects.

The spacecraft contains two propulsion systems: 1) a solid-propellant, main retro-engine that provides the primary braking during terminal descent, and 2) a variable, low-thrust, liquid-propellant system of three vernier engines capable of executing a midcourse trajectory correction and of providing braking and attitude control during terminal descent.

During the terminal sequence, the propulsion system is controlled automatically by a radar system that measures altitude and velocity components with respect to the lunar surface.

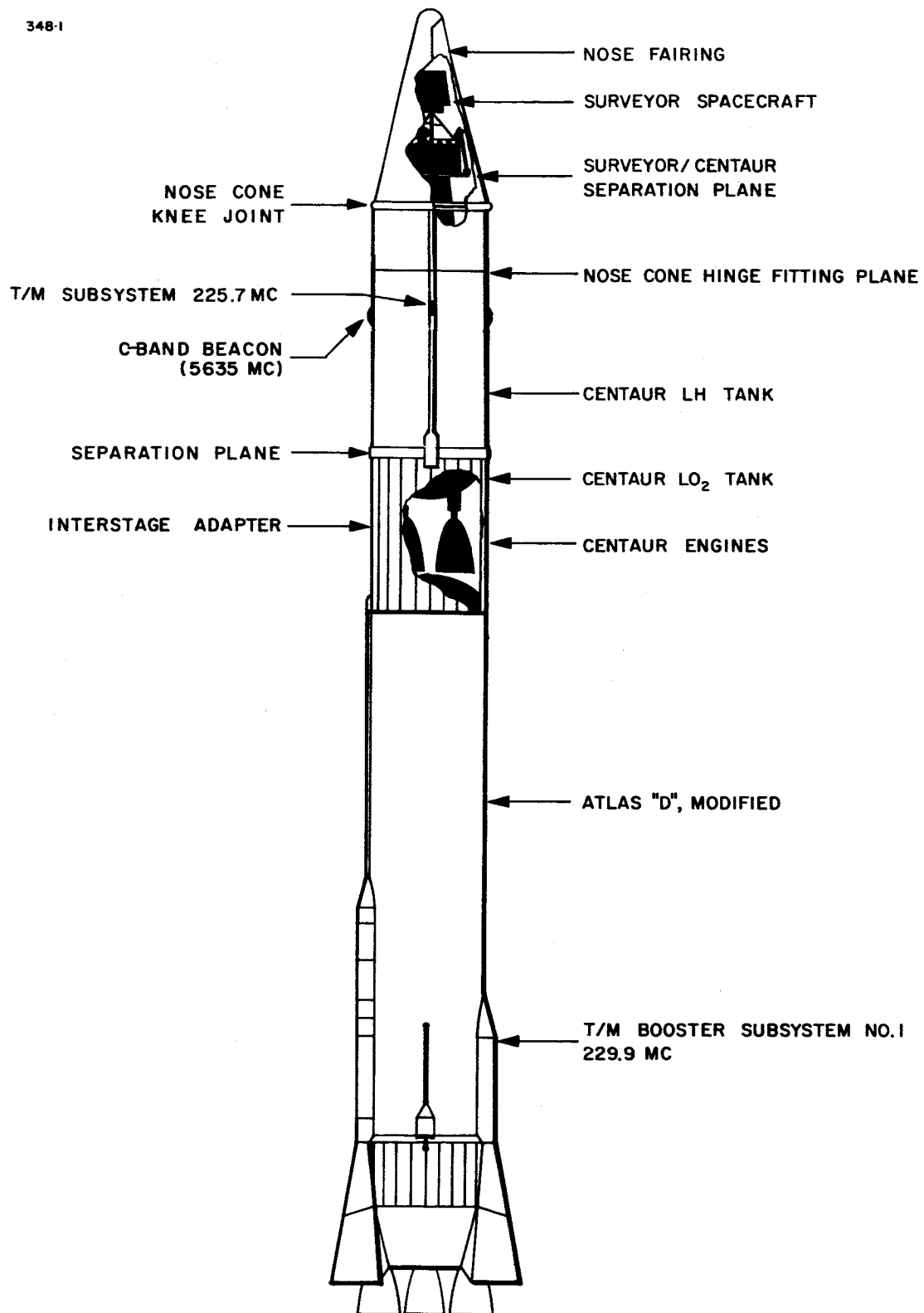


FIGURE I-1. ATLAS/CENTAUR/SURVEYOR CONFIGURATION  
(INFORMATION ONLY)

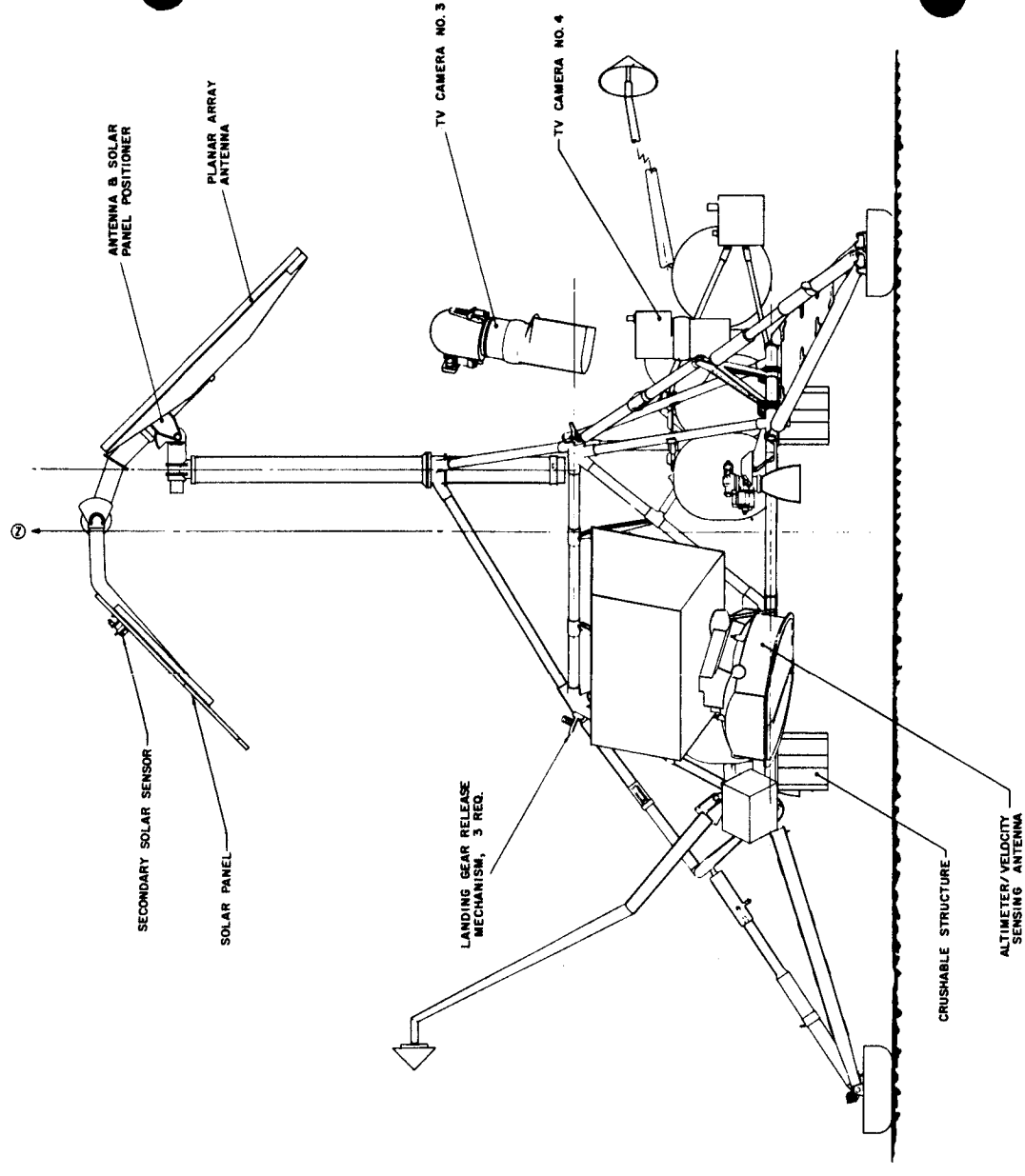
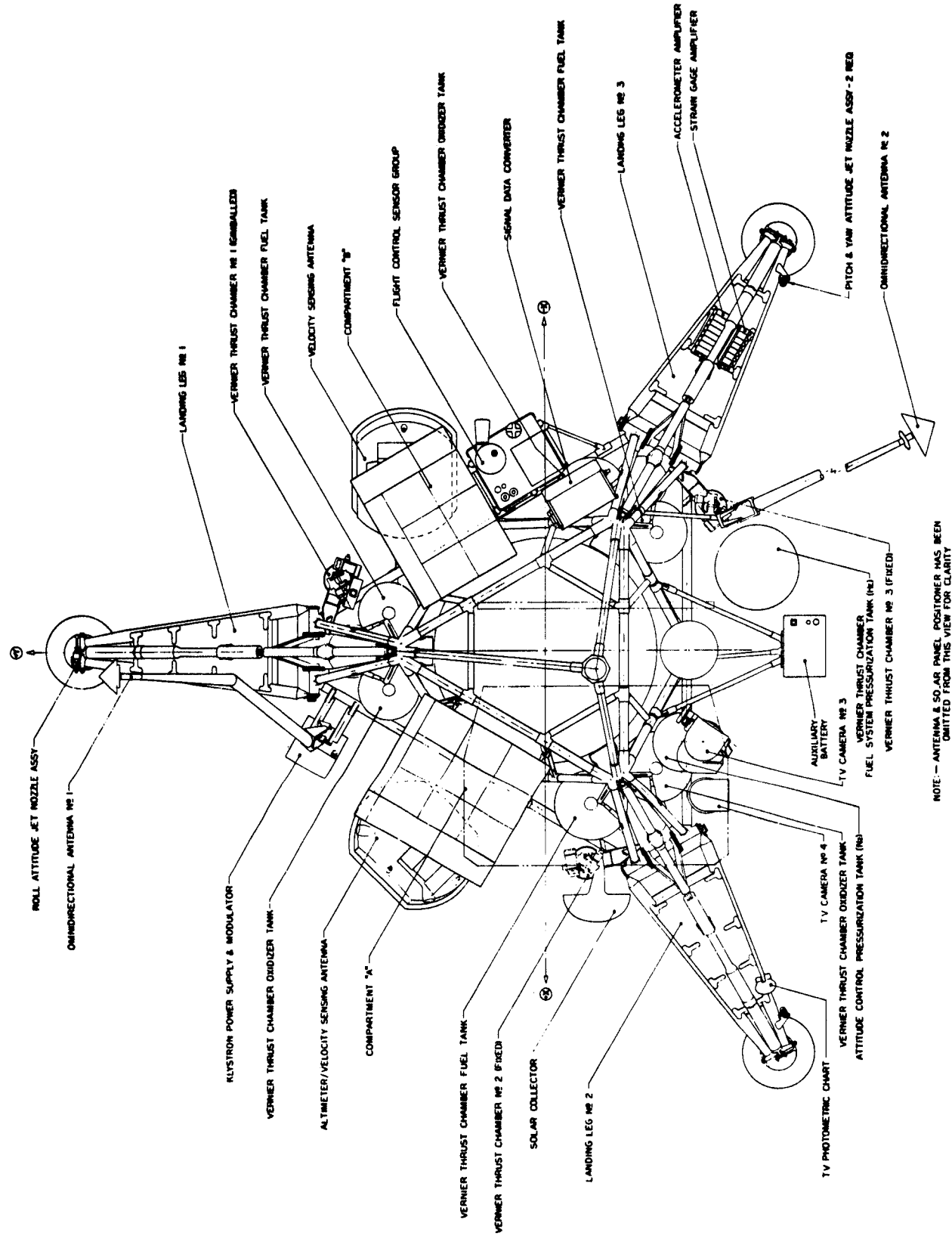


FIGURE I-2. SURVEYOR SPACECRAFT DYNAMIC MODEL, TOP AND SIDE VIEWS

The spacecraft has a two-way telecommunications system that provides: 1) a method of telemetering information to the Earth, 2) the capability of receiving and processing commands to the spacecraft, and 3) angle tracking and one- or two-way doppler for orbit determination.

Two receivers (for reliability) operate continuously. Commands pass through the receivers to the central command decoder, and are then routed to the subsystem decoder that controls a particular subsystem of the spacecraft, e. g., electrical power, flight control.

Either of two identical transmitters can be selected by ground commands. Each is capable of operating in either a high-power or a low-power mode in accordance with the bandwidth of the transmitted data. A signal processing system transforms television and engineering data signals into a form suitable for modulating the transmitter.

Highly accurate tracking of the spacecraft is obtained by spacecraft transponders that permit two-way doppler shift measurements. In this mode, one of the transmitters is phase-locked to one of the receivers through transponder interconnection circuitry, and the signal transmitted back to Earth is coherent with the received signal. Two transponder interconnection units are used for reliability.

There are three telecommunications antennas aboard the spacecraft: a high-gain directional antenna, the planar array, used only for transmission; and two omnidirectional conical antennas. The planar array orientation, with respect to the vehicle, is controlled by Earth commands. Each of the omnidirectional antennas is permanently connected through a diplexer to one of the spacecraft receivers. The omnidirectional antennas are positioned so that commands can be received regardless of spacecraft attitude.

The spacecraft derives its electrical power from a solar panel and two storage batteries. The solar panel furnishes power for functional use and for battery charging during transit and the lunar day. A primary 2640-ampere-hour battery or a reserve 1000-ampere-hour battery will supply power during the lunar night and during periods of peak load during transit.

The spacecraft will carry two television cameras: an approach camera, and a survey camera with scanning capability. The approach camera will take pictures during the approach to the Moon starting at an altitude of approximately 1000 miles. After touchdown, the survey camera will provide sequential frame surveys of the lunar surface. The survey camera has a motor-driven lens for focusing, and motor-driven mirrors for pan-and-tilt control.

### C. MISSION PROFILE

The spacecraft will be carried by an Atlas/Centaur vehicle through a direct ascent flight path and injected into a nominal 66-hour transit trajectory (see Figure I-3).

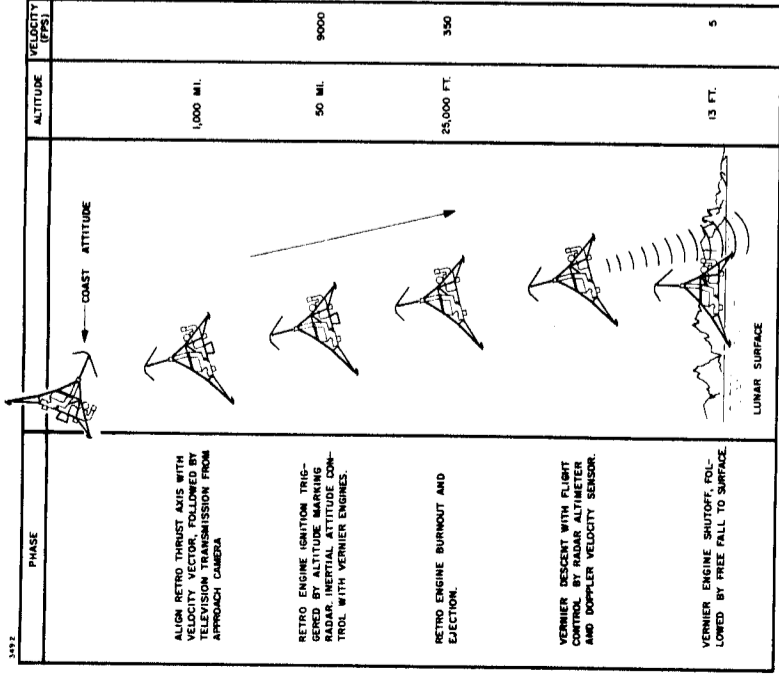
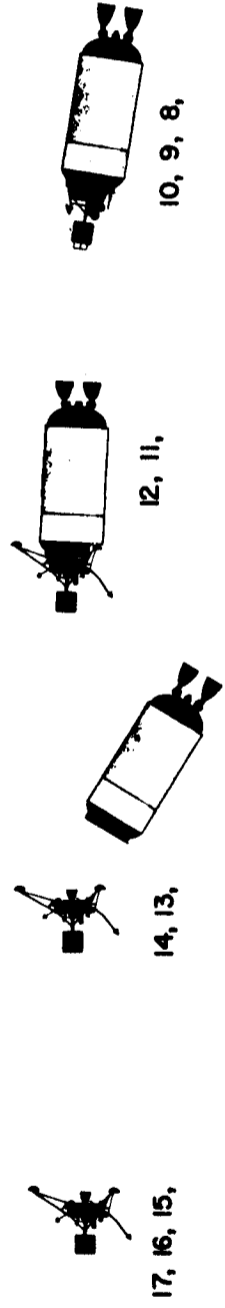
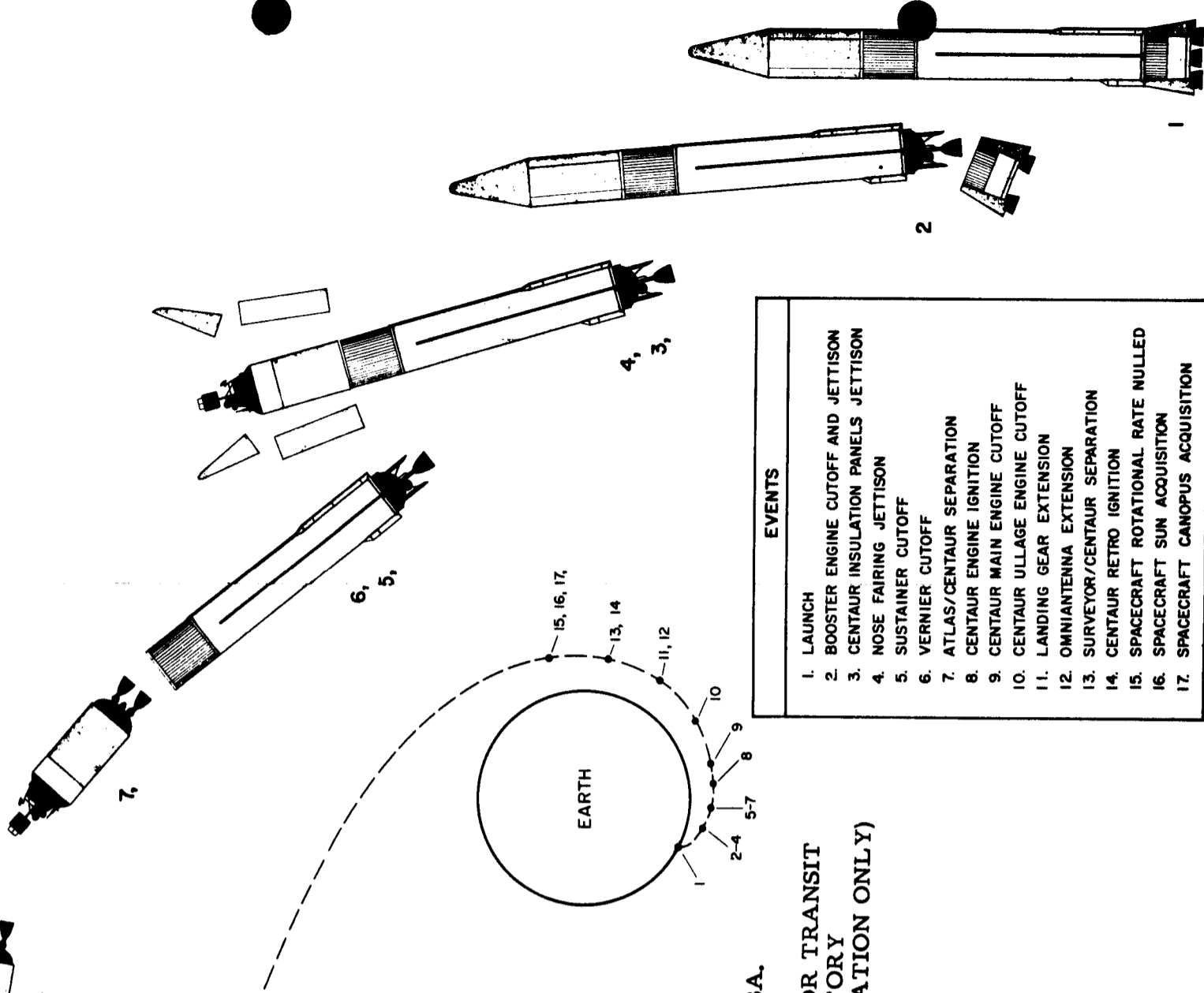


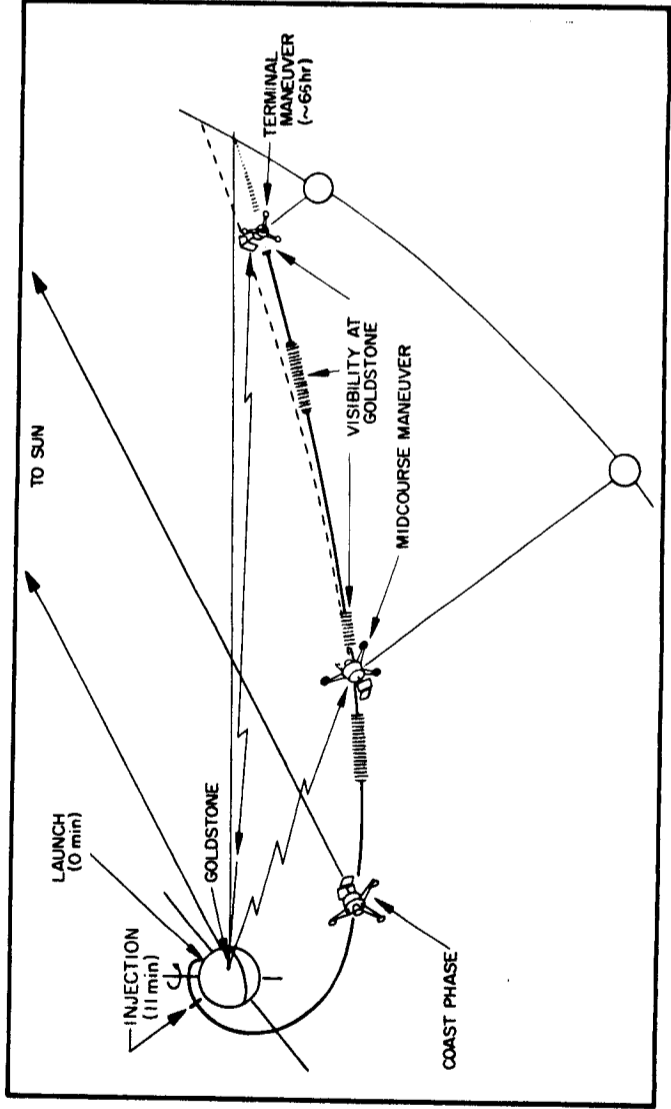
FIGURE I-3C. SURVEYOR TERMINAL DESCENT

FIGURE I-3B. MISSION SEQUENCE FROM LAUNCH TO CANOPUS ACQUISITION



EVENTS	
1. LAUNCH	
2. BOOSTER ENGINE CUTOFF AND JETTISON	
3. CENTAUR INSULATION PANELS JETTISON	
4. NOSE FAIRING JETTISON	
5. SUSTAINER CUTOFF	
6. VERNIER CUTOFF	
7. ATLAS/CENTAUR SEPARATION	
8. CENTAUR ENGINE IGNITION	
9. CENTAUR MAIN ENGINE CUTOFF	
10. CENTAUR ULLAGE ENGINE CUTOFF	
11. LANDING GEAR EXTENSION	
12. OMNIAUTENNA EXTENSION	
13. SURVEYOR/CENTAUR SEPARATION	
14. CENTAUR RETRO IGNITION	
15. SPACECRAFT ROTATIONAL RATE NULLED	
16. SPACECRAFT SUN ACQUISITION	
17. SPACECRAFT CANOPUS ACQUISITION	

FIGURE I-3A. SURVEYOR TRANSIT TRAJECTORY (INFORMATION ONLY)



The Atlas booster engine cuts off and is jettisoned shortly after launch. Some time before the sustainer and vernier engines burn out, commands from the Centaur programmer will initiate ejection of the Centaur insulation panels and the spacecraft nose fairing. After sustainer and vernier engine burnout, the Centaur separates from the Atlas. The Centaur engines then ignite, drive the vehicle on into the transit trajectory, and cut off. The Centaur programmer commands extension of the spacecraft landing legs and the omnidirectional antennas and finally, separation of the spacecraft and Centaur.

After separation, the spacecraft automatically aligns the solar cell array perpendicularly to the vehicle roll axis and acquires the Sun, thereby providing a fixed reference for orientation in the yaw and pitch axes. Before the mid-course correction is accomplished, Canopus must be acquired to provide fixed reference for orientation in roll. The midcourse correction maneuver will be executed approximately 15 hours after injection to bring the spacecraft into a trajectory terminating at the desired point on the lunar surface. This maneuver will be computed at JPL, Pasadena, from tracking information supplied by the DSIF.

As the first step in the terminal maneuver, the spacecraft roll axis is aligned along the velocity vector and the high-gain antenna is aligned toward Earth. Television viewing of the lunar surface begins about 10 minutes before impact. All radars are turned on approximately five minutes before predicted impact. Following a "command enabling" signal to the trigger radar, the landing sequence is automatic. At a slant range of approximately 50 miles from the Moon, the vernier control engines and the main retro-engine are ignited. The retro-engine separates from the spacecraft after burnout at a nominal lunar altitude of 30,000 feet. The vernier engines then operate under control of the doppler radar and the precision altimeter radar so as to slow the spacecraft velocity to about 5 feet per second at a 13-foot altitude. At this time, the vernier engines shut off, and the spacecraft free-falls to the surface.

The solar panel and planar array will be unlocked and properly oriented after landing. The post-touchdown condition of the spacecraft will be evaluated by a sampling of all modes of engineering data and by an attempt to manipulate spacecraft mechanisms. Television survey sequences will then be directed by ground commands.

The landing is planned to occur in a region near the Moon's equator where the angle between the unbraked, approach velocity vector and the local Moon vertical is approximately zero degrees. The spacecraft design provides landing capabilities for approach angles to 45 degrees with respect to the local Moon vertical; thus, landings can be accomplished in other maria in the western region of the face of the Moon as shown in Figure I-4. It is planned that the lunar landing be observed from the Goldstone station and that this visibility be maintained for a period of not less than three hours after landing.

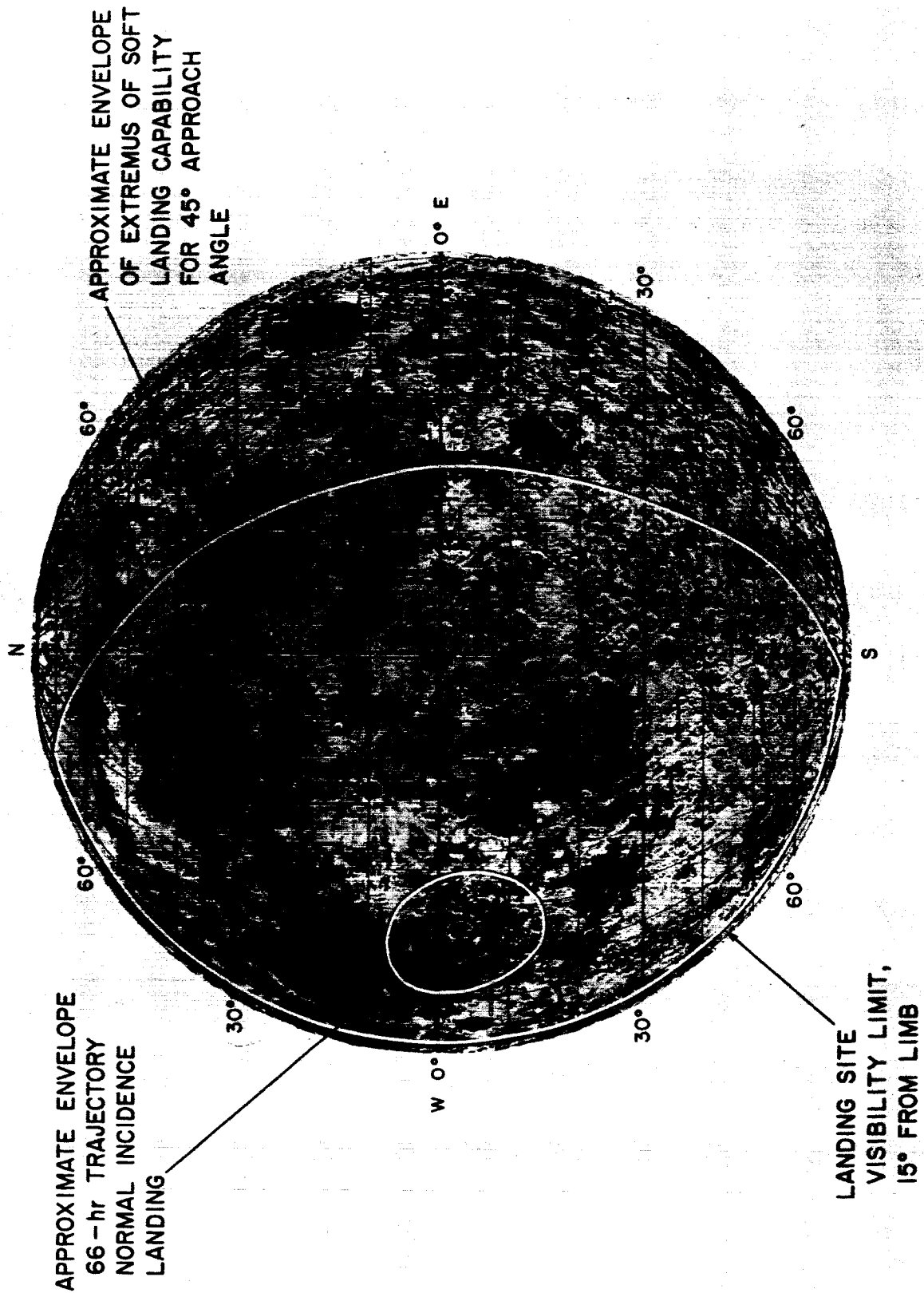


FIGURE I-4. SURVEYOR LUNAR LANDING AREAS

## D. OPERATIONAL ORGANIZATION

The Surveyor space flight operations organizational structure is shown in Figure I-5. Primary mission responsibilities and the authority of the individual organization members are as follows:

### 1. Project Manager

The Project Manager has the responsibility and authority for the execution, to completion, of the development and operation of the project.

### 2. Space Flight Operations Director

It is the function of the Space Flight Operations Director to support the Project Manager in the preparation and execution of the standard operating procedure for space flight operations, i. e., the Space Flight Operations Plan (SFOP). The standard operating procedure is defined as the method by which the space flight operations will be conducted in both the nominal case and in anticipated departures from the nominal case.

#### a. Preflight Phase

During the preflight phase, it is the responsibility of the Space Flight Operations Director, supported by appropriate JPL and HAC personnel, to coordinate and integrate requirements that are established by the cognizant divisions for the standard operating procedure to be followed during the inflight phase. The Space Flight Operations Director is empowered to request information and resolve conflicting requirements, within the framework of existing Laboratory structure and within the authority of the program, as required to fulfill this responsibility.

#### b. Inflight Phase

During the inflight phase, it is the responsibility of the Space Flight Operations Director to:

- 1) Interpret the standard operating procedure and place requirements consistent with this SFOP on the various operating groups.
- 2) Resolve any ambiguities directly associated with the standard operating procedure arising during its execution.
- 3) Make appropriate decisions requiring emergency action to ensure success of the mission if the Assistant Laboratory Director for Projects, the Project Manager, or the Space Operations System Manager cannot be contacted.

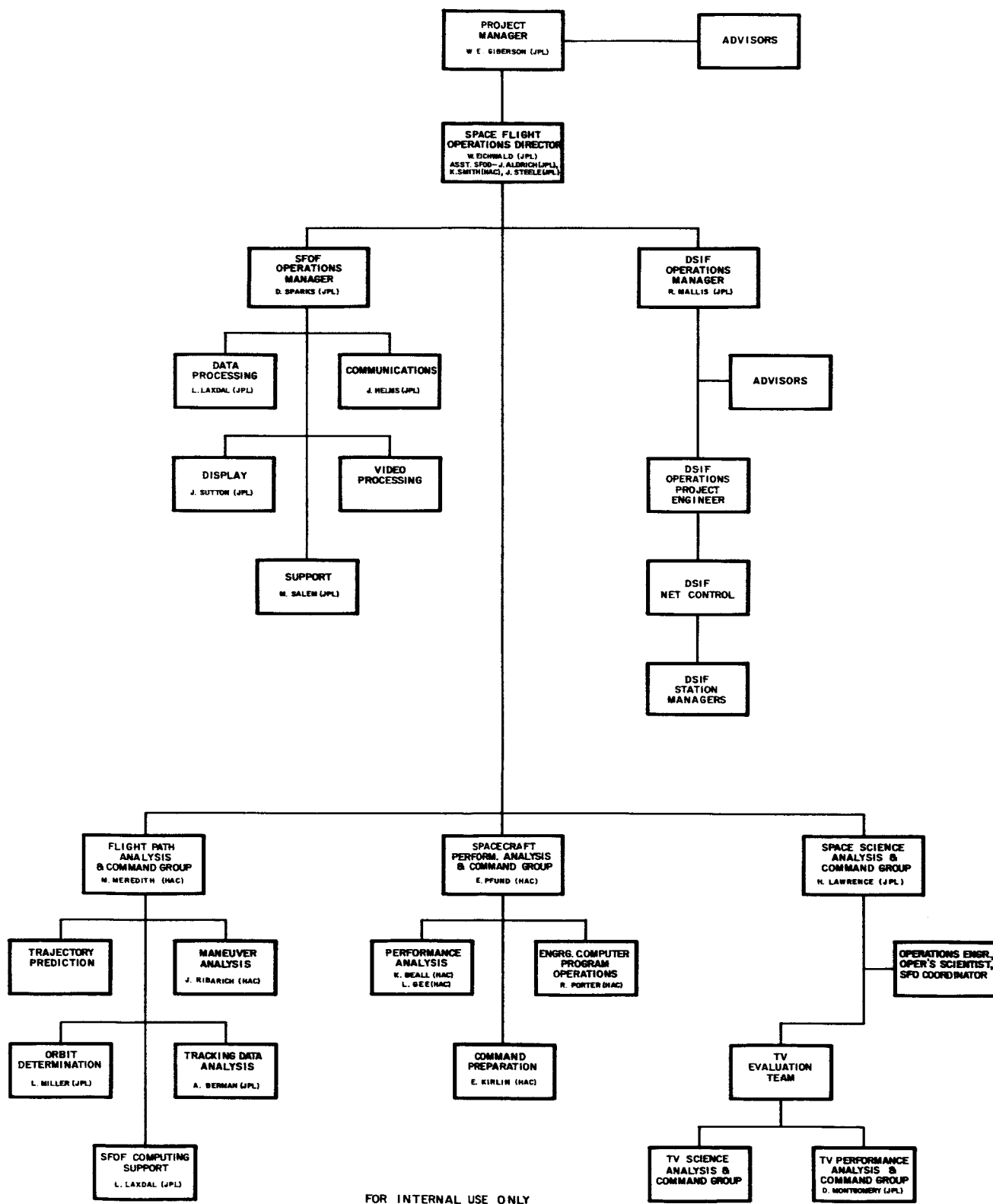


FIGURE I-5. SURVEYOR SPACE FLIGHT OPERATIONS ORGANIZATION

In the fulfillment of this responsibility, the Space Flight Operations Director is accountable to the Assistant Laboratory Director for Projects, the Project Manager, or to the Space Operations System Manager, and is delegated authority of the Project Manager for placement of requirements on operating groups in accordance with the SFOP.

3. Advisors

It is the function of the advisors to be aware of the performance of the spacecraft system, of the instrumentation subsystem, and of the DSIF during flight, and to supply judgments to the Project Manager as to possible future courses of action in the event of nonstandard behavior of the spacecraft.

4. SFOF Operations Manager

It is the responsibility of the SFOF Operations Manager to direct the operation of the SFOF during space flight operations and to commit and control all functions in the SFOF during the preparation and execution of each flight operation.

a. Data Processing Project Engineer

It is the responsibility of the Data Processing Project Engineer to commit and control the data processing, conversion, distribution, and display equipment and personnel during the preparation and execution of each flight operation.

b. Communications Coordinator

It is the responsibility of the Communications Coordinator to commit and control the operational communications equipment and personnel within the SFOF and the equipment within the Space Flight Operations System during the preparation and execution of each flight operation.

c. Display Group

It is the function of this group to display operational and technical information for mission and operations control and evaluation.

d. Video Processing Group

It is the function of this group to process the spacecraft video data into a form suitable for analysis.

e. SFOF Support Group

This group will supply operational, maintenance, clerical, and other general support as required for the operation.

## 5. DSIF Operations Manager

It is the responsibility of the DSIF Operations Manager to direct the operation of the DSIF and to commit and control DSIF personnel and equipment at each station during the preparation and execution of each flight operation.

### a. DSIF Net Control

It is the function of this group to be the direct line of contact with the DSIF stations. DSIF Net Control will supply the stations with operational requirements and status and will inform the DSIF Operations Manager of station status.

### b. DSIF Advisors

It is the responsibility of the DSIF Advisors to keep the DSIF Operations Manager informed of the current state of the DSIF and to advise future courses of action.

### c. DSIF Station Managers

It is the responsibility of the DSIF Station Manager to direct the operation of the DSIF station to which he is assigned, and to control the functions of the personnel and equipment of his station.

## 6. Technical Analysis Groups

Each of the technical analysis groups (FPAC, SPAC, and SSAC) is headed by a Technical Director who is responsible for integrating, directing, and coordinating the preflight, flight, and postflight activities of his group and who will support the SFOD in the planning and conduct of Surveyor space flight operations. It is the responsibility of these groups to assist in defining the standard mission, to recommend courses of action that will provide optimum value from the mission during nonstandard situations, and to perform the intra- and inter-group technical liaison required to achieve these objectives.

### a. Flight Path Analysis and Command (FPAC) Group

It is the responsibility of this group to use the tracking and telemetry data to obtain the best estimate of the actual trajectory of the spacecraft and, supported by the DSIF, to interpret the tracking data supplied by the tracking stations. Additionally, it is the responsibility of this group to determine the spacecraft commands affecting the flight path by utilizing, to the degree required, the support of the SPAC group and the SSAC group. FPAC will consist of:

- 1) Computing Support Group
- 2) Trajectory Group

- 3) Tracking Data Analysis Group
- 4) Orbit Determination Group
- 5) Maneuver Analysis Group

b. Spacecraft Performance Analysis and Command (SPAC) Group

It is the responsibility of this group to determine the spacecraft performance and to determine commands to the spacecraft as required by the engineering behavior and performance of the spacecraft. SPAC will include:

- 1) Performance Analysis Group
- 2) Engineering Computer Program Operations Group
- 3) Command Preparation Group

c. Space Science Analysis and Command (SSAC) Group

It is the responsibility of this group to control the flow of, and the mathematical operations performed on the data related to the scientific experiments during the interval between its receipt by the DSIF and its transmission to the appropriate scientists. Additionally, it is the responsibility of this group to determine those commands to the spacecraft pertaining to the scientific experiments. This group will consist of:

- 1) Operations Engineer
- 2) Operations Scientist
- 3) SFO Coordinator
- 4) Television Evaluation Team Chairman
- 5) TV Performance Analysis and Command Group
- 6) Television Science Analysis and Command Group

## SECTION II

## OPERATIONAL FACILITIES

## A. GENERAL

This section describes the Space Flight Operations System (SFOS) that will be used for Surveyor Mission A. The facilities at the Air Force Eastern Test Range (AFETR), the facilities of the Deep Space Instrumentation Facility (DSIF), the Space Flight Operations Facility (SFOF), and the communications between these facilities are described.

## B. AIR FORCE EASTERN TEST RANGE

The support for Surveyor Mission A required of AFETR is fully described in the AFETR Program Requirements Document (PRD) No. 3400. The facilities that will be used by AFETR in support of Surveyor Mission A are described in the AFETR Program Support Plan (PSP) No. 3400.

Detailed countdown information will be forwarded to Pasadena from the JPL/HAC Operations Center at AFETR during the prelaunch countdown. Additionally, event information from launch through separation will be supplied by AFETR. Details regarding the handling of this information at AFETR and within the JPL/HAC Operations Center at AFETR will be found in the Surveyor Assembly and Operations Plan (HAC).

After launch, extensive use of the tracking and telemetry facilities at AFETR will be made in support of the mission. Those requirements are described in the following paragraphs. C-band tracking data will be obtained from the launch vehicle by means of the facilities shown in Figure II-1. Trajectory and prediction data will be generated from the raw data and forwarded in near-real time to the JPL Operations Center at AFETR for relay to the SFOF in Pasadena, California. S-band and VHF telemetry data will be transferred from AFETR to the SFOF in real time as shown in Figure II-2; recorded S-band and VHF telemetry data will be forwarded to the JPL/HAC Operations Center at AFETR.

1. Tracking Data Requirements

There are three requirements for near-real time data during the postinjection phases of the direct ascent trajectory:

- a. It is required that AFETR obtain an initial estimate of the spacecraft injection conditions which will be forwarded, by AFETR, to the JPL/HAC Operations Center at AFETR in real time for relay to the SFOF.





- b. Initial acquisition data for the DSIF is required from AFETR. The raw tracking data obtained from downrange stations will be forwarded to the Cape Computing Facility (CCF) at AFETR. This data, in conjunction with pertinent telemetry data, will be used to determine the trajectory of the spacecraft. Table II-I shows the format for all computed data furnished by AFETR to JPL/HAC.

The acquisition data shown in Table II-I will be computed and forwarded to the JPL/HAC Operations Center at AFETR for relay to the SFOF in Pasadena and thence to the DSIF stations.

- c. Semi-raw tracking data will be transferred from the Cape Computing Facility to the JPL/HAC Operations Center, AFETR, for relay to the SFOF. The format of this data is shown in Table II-II.

## 2. Telemetry Requirements

- a. Launch vehicle and spacecraft telemetry obtained through the Centaur VHF link, and spacecraft telemetry obtained through the spacecraft S-band link, are recorded at the AFETR stations. The recorded information will be forwarded to JPL/HAC at AFETR in nonreal time.
- b. Launch vehicle and spacecraft event information is obtained at AFETR stations and is transmitted by voice lines in real time to the JPL/HAC Operations Center at AFETR for relay to the SFOF.
- c. Spacecraft telemetry obtained via the VHF link will be transmitted in real time to the JPL/HAC Operations Center at AFETR for relay to the SFOF from launch until immediately prior to spacecraft/Centaur electrical disconnect. Thereafter, spacecraft telemetry obtained via the S-band link will be transmitted in real time to JPL/HAC. Additionally, the telemetry may be monitored at the AFETR stations, and the performance of the spacecraft reported to JPL/HAC in real time by voice line.

TABLE II-I. AFETR TTY FORMAT FOR COMPUTED DATA

A. First Message

Actual launch time and azimuth.

LIFTOFF DAY XXX HMS XX XX XX.X GMT AZL XXX.XX

B. Second Message

Orbital elements and injection conditions.

1. TTY Format

ELEMENTS AND INJECTION CONDITIONS OF TRANSFER

ORBIT YYY.YY

H M S XX XX XX.X L PLUS TIME XXXXX. ALT XXX.XX

SMA XXXXXX.X ECC X.XXXXXX INC XXX.XX C3 XX.XX

LAN XXX.XXX APF XXX.XXX TA XXX.XXX

R XXXXX.XX LAT XX.XXX LON XXX.XXX VE XX.XXX

PTE XX.XXX AZE XXX.XXX

2. Nomenclature

YYY.YY	Data source of computations. The number before the decimal is the station ID; the number after the decimal indicates the number of the transmission. (AFETR is to use numbers 01-09.)
--------	---

HMS	Epoch - Universal Time (Hours, Minutes, and Seconds); time at which osculating conic is calculated
-----	--

L PLUS TIME	Epoch, seconds after liftoff
-------------	------------------------------

ALT	Altitude in kilometers
-----	------------------------

(This table continued on next page.)

TABLE II-I. (CONT'D)

2. Nomenclature (Cont'd)

SMA	Semimajor axis of conic section in kilometers
ECC	Eccentricity of conic section
INC	Inclination - Angle between the orbital plane and the Earth's (instantaneous) equator. Degrees, between 0° (zero) and 360°
C3	Twice the total energy per unit mass or vis viva in $\text{km}^2/\text{sec}^2$ .
LAN	Right ascension of the ascending node. Degrees, from 0° (zero) to 360°. Measured from the vernal equinox of date in the instantaneous equatorial plane.
APF	Argument of Perigee. Angle, in the orbital plane, eastward from the ascending node to the perigee point. Degrees, from 0° (zero) to 360°.
TA	True anomaly at epoch. The angle measured from perigee to the spacecraft. Measured eastward in degrees.
R	Injection radius in kilometers
LAT	Injection latitude in degrees
LON	Injection longitude in degrees
VE	Earth-fixed speed in kilometers per second
PTE	Earth-fixed path angle at injection in degrees
AZE	Injection azimuth in degrees

(This table continued on next page.)

TABLE II-I. (CONT'D)

C. Third Message

Acquisition information for DSIF.

1. TTY Format

JPL LOOK ANGLES FROM TRANSFER ORBIT

XMITTER REF FREQ XXXXXXXX XPONDER FREQ XXXXXXXX

SYN FREQ XXXXXXXX DRIFT XX.XX

H M S      HA      DEC      D1. 51      D2. 51      XA. 51      ID

XXXXXX XXX.X XXX.X XXXXXXXX XXXXXXXX XXXXXXXX LMAPQR

XXXXXX XXX.X XXX.X XXXXXXXX XXXXXXXX XXXXXXXX LMAPQR

XXXXXX XXX.X XXX.X XXXXXXXX XXXXXXXX XXXXXXXX LMAPQR

H M S XX XX XX.X RANGE XXXXX.XX

2. Nomenclature

XMITTER REF FREQ	Ground transmitter reference frequency minus $20.0 \times 10^6$ cps
------------------	--

XPONDER FREQ	Spacecraft transponder auxiliary oscillator frequency minus $2290.0 \times 10^6$ cps
--------------	---

SYN FREQ	Ground receiver synthesizer frequency minus $20.0 \times 10^6$ cps
----------	---

DRIFT	Spacecraft transmitter temperature correction in cps/sec
-------	---

RANGE	Distance from station to spacecraft in km
-------	---

HA	Hour angle in degrees
----	-----------------------

DEC	Declination in degrees
-----	------------------------

D1. 51	One-way doppler frequency for DSIF 51 in cps
--------	---

(This table continued on next page.)

TABLE II-I. (CONT'D)

2. Nomenclature (Cont'd)

D2. 51	Two-way doppler frequency for DSIF 51 in cps
XA. 51	Ground transmitter frequency minus $20.0 \times 10^6$ cps for spacecraft zero static phase error
ID	Identification code
LM	- Transmission number from 1 to 10
A	- Spacecraft transmitter code (A or B)
PQR	- Day of year

TABLE II-II. AFETR SEMI-RAW TRACKING DATA  
FORMAT FOR TTY TRANSMISSION

CHARACTER TRANSMITTED	INFORMATION
1	Carriage Return
2	Line Feed
3	Figure Shift
4	Data Type
5	Station ID
6	Station ID
7	Radar Type
8	On Track - Code 2
9	Time - H 20, 19
10	Time - H 18, 17, 16, 15
11	Time - M 14, 13, 12
12	Time - M 11, 10, 9, 8
13	Time - S 7, 6, 5
14	Time - S 4, 3, 2, 1
15	Az 21, 20, 19
16	Az 18, 17, 16
17	Az 15, 14, 13
18	Az 12, 11, 10
19	Az 9, 8, 7
20	Az 6, 5, 4
21	Az 3, 2, 1
22	El 21, 20, 19
23	El 18, 17, 16
24	El 15, 14, 13
25	El 12, 11, 10
26	El 9, 8, 7
27	El 6, 5, 4
28	El 3, 2, 1
29	R 27, 26, 25
30	R 24, 23, 22
31	R 21, 20, 19
32	R 18, 17, 16
33	R 15, 14, 13
34	R 12, 11, 10
35	R 9, 8, 7
36	R 6, 5, 4
37	R 3, 2, 1
38	End of Sample

See Legend on next page.

LEGEND

## 1. Character 4, Data Type:

- 2 - Real Time
- 3 - Simulated Data
- 7 - Last Sample

## 2. Characters 5 and 6, Station ID:

Bermuda	70
San Salvador	72
Grand Turk	73
Antigua	74
Ascension	75
Pretoria	76
Twin Falls	77
ARIS I	78
ARIS II	79

## 3. Character 8, On Track:

- Off Track - 0
- On Track - 2

## 4. Characters 9 - 14, Time:

20-Bit Binary Coded Decimal Time Code Character

## 5. Characters 15 - 21, Azimuth Data in Binary Code:

- Most Significant Digit - Bit 20 - 180 Degrees
- Least Significant Digit - Bit 1 - 0.000343 Degrees

## 6. Characters 22 - 28, Elevation Data in Binary Code:

- Most Significant Digit - Bit 20 - 180 Degrees
- Least Significant Digit - Bit 1 - 0.000343 Degrees

## 7. Characters 29 - 37, Range Data in Binary Code:

- Most Significant Digit -  $2^{26}$  - 67,108,864 Yards
- Least Significant Digit -  $2^0$  - 1 Yard

## 8. Character 38, End of Sample:

- End of Sample - Oblique Stroke

## SECTION II, C. DEEP SPACE INSTRUMENTATION FACILITY

## SECTION II, D. SPACE FLIGHT OPERATIONS FACILITY

## DEEP SPACE NETWORK

The function of the Deep Space Network (DSN) for Surveyor Mission A is to provide those facilities necessary to meet the space flight operations requirements of the Surveyor Project. The DSN includes the Deep Space Instrumentation Facility (DSIF), DSN Ground Communications System, and the Space Flight Operations Facility (SFOF).

APPROVED: \_\_\_\_\_

M. S. Johnson  
DSN Manager, Surveyor

### C. DEEP SPACE INSTRUMENTATION FACILITY (DSIF)

The function of the DSIF is to obtain angular position, doppler, telemetry, and video data from the Surveyor spacecraft during the postinjection phase of the mission. Additionally, the DSIF will transmit commands to the spacecraft in accordance with the procedures outlined in Section VI of the Surveyor Tracking Instruction Manual (TIM), EPD- (to be published).

Data obtained by the DSIF is transmitted to the SFOF in real time or near-real time by teletype and high-speed data circuits, and by wide-band microwave channel (from Goldstone only). The same data is recorded on magnetic tape at the DSIF station and dispatched to JPL by airmail.

#### 1. DSIF Coverage

Three DSIF stations are committed to meet the requirements placed on the DSIF by the Surveyor Project; these are designated the prime stations. They are Goldstone Pioneer (DSIF 11), Johannesburg (DSIF 51), and Canberra (DSIF 42). The DSIF will provide coverage as specified in Table II-III.

The full Goldstone Duplicate Standard (GSDS) S-band system will be used at Goldstone Pioneer (DSIF 11), Canberra (DSIF 42), and for the DSIF 51 acquisition aid. The L-to-S band (L/S) conversion system will be used at Johannesburg (DSIF 51). The parameters and capabilities of the DSIF stations are given in Table II-IV. Block diagrams of the stations are presented in Figures II-3 through II-5.

Acquisition and prediction information required by the DSIF is given in Table II-V. The tracking data to be supplied by the DSIF to the SFOF for orbit determination is shown in Table II-VI. Ground station tracking modes are listed in Table II-VII. The data condition codes used by the DSIF stations are listed in Table II-VIII.

TABLE II-III. DSIF COVERAGE

PHASE	DSIF COVERAGE
Transit	24-hour/Earth day
If landing is achieved	
1. First lunar day and night	24-hour/Earth day
2. Second lunar day*	a. 24-hour/Earth day for first three Earth days b. 24-hour/Earth day for last two Earth days c. One ten-hour pass/Earth day between a. and b. above
3. Succeeding lunar days and nights*	a. 24-hour/Earth day for first three Earth days b. 24-hour/Earth day for last two Earth days c. One ten-hour pass/Earth day between a. and b. above
If no landing is achieved	a. 24-hour/Earth day for not more than three Earth days after encounter b. 8-hour/Earth day for additional 10 Earth days

\* 24-hour/Earth day coverage required whenever valuable data can be provided by spacecraft instruments.

TABLE II-IV. DSIF CAPABILITIES FOR SURVEYOR

1. STATION NAME	Goldstone Pioneer GSDS S-Band	Canberra GSDS S-Band	Johannesburg L/S Conversion
2. STATION ID	DSIF 11	DSIF 42	DSIF 51
3. RECEIVER CAPABILITY	One	One	One
4. ANTENNA	85' Parabolic	85' Parabolic	85' Parabolic
5. MOUNT	Polar (HA-Dec)	Polar (HA-Dec)	Polar (HA-Dec)
6. MAX. ANGULAR RATE (BOTH AXES)	0.7 Deg/Sec	0.7 Deg/Sec	0.7 Deg/Sec
7. FREQUENCY RECEIVING (mc) TRANSMITTING (mc)	2295 2115	2295 2115	2295 2115
8. ANTENNA GAIN RECEIVING TRANSMITTING	53.0 db +1.0 -0.5 51.0 db +1.0 -0.5	53.0 db +1.0 -0.5 51.0 db +1.0 -0.5	53.0 db +1.0 -0.5 51.0 db +1.0 -0.5
9. ANTENNA BEAMWIDTH	0.4 deg	0.4 deg	0.4 deg.
10. TYPICAL SYSTEM TEMP. WITH PARAMP WITH MASER	270°K +50 55°K ±10	270°K +50 55°K ±10	270°K +50 55°K ±10
11. TRANSMITTER POWER	10 kw	10 kw	10 kw
12. DATA TRANSMISSION (TTY) a) ANGLES b) DOPPLER c) TELEMETRY	Near-Real Time Near-Real Time Real Time	Near-Real Time Near-Real Time Real Time	Near-Real Time Near-Real Time Real Time
13. CDC CAPABILITY	Yes	Yes	Yes
14. DATA PACK AIR SHIPMENT TIME TO JPL	1 Day	7 Days	5 Days

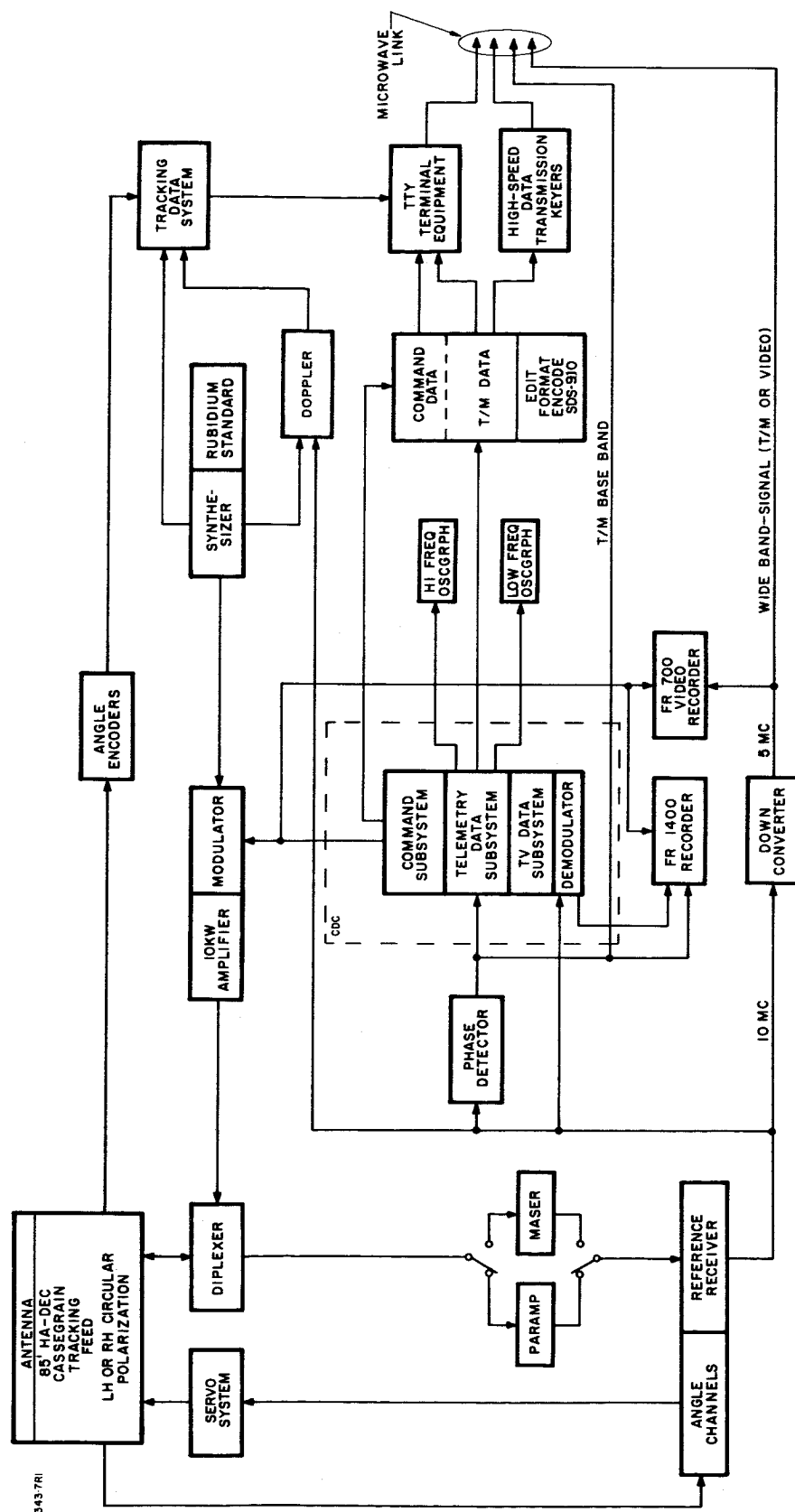


FIGURE II-3. GOLDSTONE PIONEER STATION (DSIF 11) S-BAND

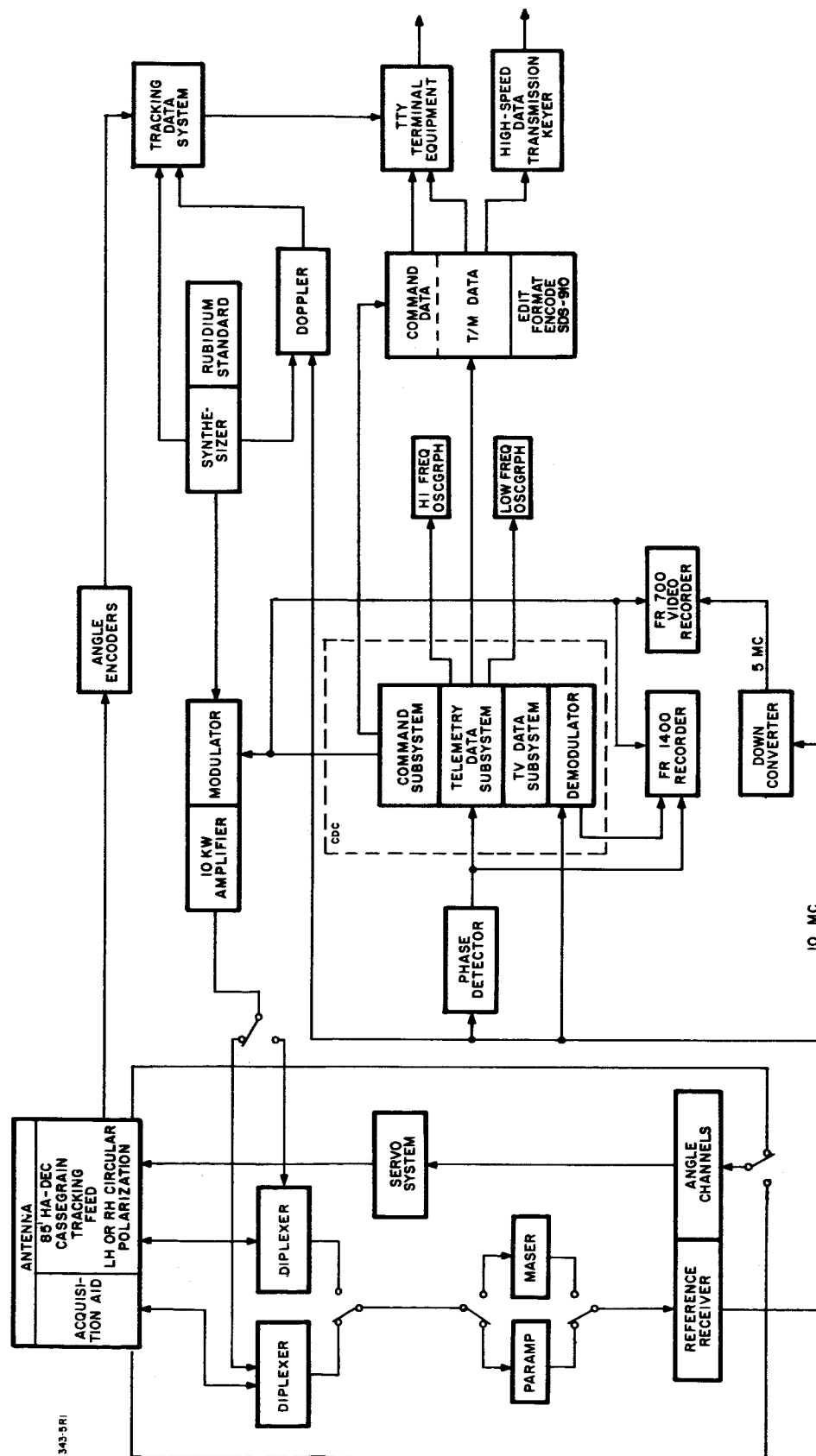


FIGURE II-4. JOHANNESBURG STATION (DSIF 51) L/S CONVERSION

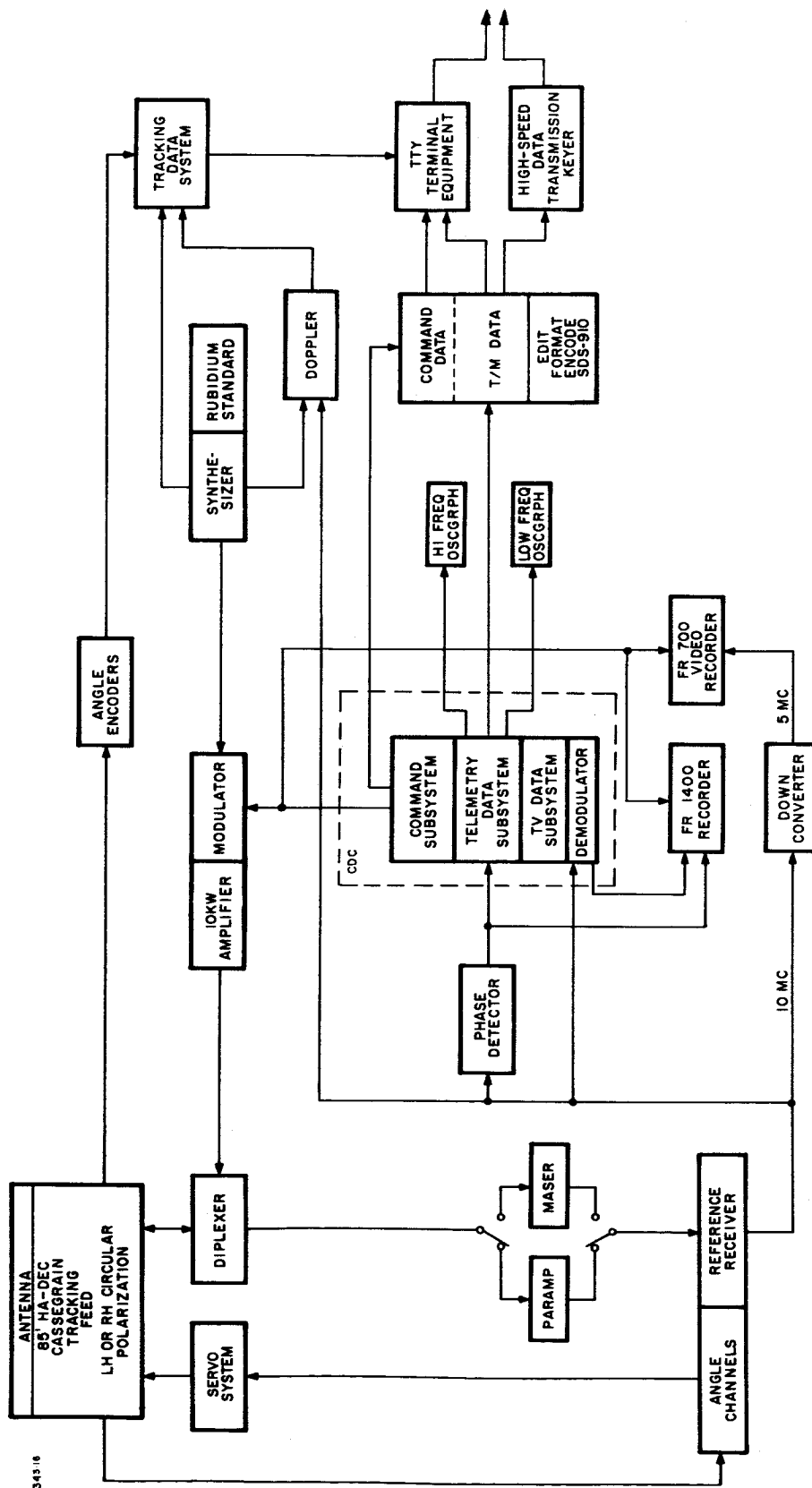


FIGURE II-5. CANBERRA STATION (DSIF 42) S-BAND

TABLE II-V. ACQUISITION AND PREDICTION  
INFORMATION FOR THE DSIFA. Format1. Calculated at JPL

JPL LOOK ANGLES (Station Name)

JPL PREDICTS (Transmission Number)

XMITTER REF FREQ XXXXXXXX XPONDER FREQ XXXXXXXX

SYN FREQ XXXXXXXX DRIFT XX.XX

H M S XX XX XX.X RANGE XXXXXXX.XX

H M S HA DEC D1. AB D2. AB XA. AB ID

XXXXXX XXX.X XXX.X XXXXXXXX XXXXXXXX XXXXXXXX LMAPQR

XXXXXX XXX.X XXX.X XXXXXXXX XXXXXXXX XXXXXXXX LMAPQR

XXXXXX XXX.X XXX.X XXXXXXXX XXXXXXXX XXXXXXXX LMAPQR

2. Calculated at AFETR

See Table II-I.

B. Nomenclature

D1. AB One-way doppler frequency for Station B, Zone A, cps

D2. AB Two-way doppler frequency for Station B, Zone A, cps

XA. AB Ground transmitter frequency minus  $20.0 \times 10^6$  cps for spacecraft zero static phase error for Station B, Zone A, cpsC. Sample Rate

(To be supplied at a later date.)

D. Availability of Data

(To be supplied at a later date.)

TABLE II-VI. TRACKING DATA SUPPLIED BY THE DSIF

- A. The tracking data from DSIF 11, 42, and 51 will contain time (GMT), a data condition code, hour angle (decimal degrees, nearest two-thousandth), declination angle (decimal degrees, nearest two-thousandth), doppler cycle count (to nearest cycle), and day of year. The format will be:

<u>DSIF</u> <u>STATION</u>	<u>FORMAT</u> <u>I.D.</u>	<u>SPACE-</u> <u>CRAFT</u> <u>I.D.</u>	<u>DATA</u> <u>CONDITION</u> <u>CODE</u>	<u>GMT</u>	<u>DAY OF</u> <u>YEAR</u>	<u>DOPPLER</u> <u>COUNT</u>	<u>HOURL * ANGLE</u> <u>(deg)</u>	<u>DECLIN- ATION *</u> <u>ANGLE</u> <u>(deg)</u>
XX	XX	XX	XXXX	XXXXXX	XXX	XXXXXXXXXX	XXXXXX	XXXXXX

- B. Data sampling and doppler counting times:  
(To be supplied at a later date.)

\* The angle data from DSIF 11 will not be the result of auto-track operation.

TABLE II-VII. GROUND STATION TRACKING MODES

This mode description is used to define the station configuration. The code is broken into two parts. The first defines the Transmit/Receive mode and the second the Antenna Feed configuration.

TRANSMIT/RECEIVE		FEED	
0	No receive (transmit only)	0	Not Used
1	One-way doppler (receive only)	1	Horn feed diplexer combination
2	Two-way, one-station (transmit/receive)	2	Tracking feed diplexer combination
3	Two-way, two-station non-coherent (receive only)	3	Acquisition antenna
4	Two-way, two-station coherent (not applicable to Surveyor)	4	Dipole feed
5	Receive only. No doppler	5	Horn feed, no diplexer (receive only)

Example: GM 21; transmitting to spacecraft and receiving two-way doppler; horn feed and diplexer.

NOTE: Telemetry will be available in all receive modes except GM 0.

TABLE II-VIII. DATA CONDITION CODE USED BY DSIF STATIONS

DIGIT NO. 1			DIGIT NO. 2	
Doppler Averaging Time			Receiver & Servo Data Condition	
<u>Value of Digit</u>		<u>Time</u>	<u>Value of Digit</u>	<u>Data Condition</u>
0		1 Sec	0	Good Doppler & Angle Data
1		5 Sec	1	Bad Angle Data, Auto Sense
2		10 Sec	2	Bad Doppler Data, Auto Sense
3		20 Sec	3	Bad Doppler & Angle Data, Auto Sense
4		30 Sec	4	Not Used
5		40 Sec	5	Bad Angle Data, Manual Switch
6		50 Sec	6	Bad Doppler Data, Manual Switch
7		60 Sec	7	Bad Doppler & Angle Data, Manual Switches
8		Nondestructive		

DIGIT NO. 3			DIGIT NO. 4	
Doppler Mode			Atomic Frequency Standard	
<u>Value of Digit</u>	<u>Counter Recorder</u>	<u>Doppler Mode</u>	<u>Value of Digit</u>	<u>Data Condition</u>
0	1	Two-Way ( $C_2$ )	0	In Lock
1	1	One-Way ( $C_1$ )	1	Out of Lock
2	1	Pseudo Two-Way ( $C_3$ )	2	Not Applicable
3*	1	Two-Way, Two-Station Coherent ( $C_{c3}$ )		
4	2	Two-Way ( $C_2$ )		
5	2	One-Way ( $C_1$ )		
6	2	Pseudo Two-Way ( $C_3$ )		
7*	2	Two-Way, Two-Station Coherent ( $C_{c3}$ )		

\* Not applicable to Surveyor

## D. SPACE FLIGHT OPERATIONS FACILITY

### 1. General

Control of Space Flight Operations for Surveyor Mission A will be exercised from the SFOF by the Surveyor Project Office. In addition to providing the capability of exercising this control, the SFOF shall provide the necessary data processing, communications, display, and support capabilities required by the technical groups and the DSIF to perform the analysis, evaluation, and interpretation of spacecraft and/or spacecraft-related data, and to determine and implement the ground control of the spacecraft.

### 2. Control and Analysis Functions in the SFOF

The space flight operations associated with Surveyor will be directed by the Space Flight Operations Director (SFOD) from the SFOF. The SFOD will operate from Mission Control Room No. 1, adjacent to the Operations Area of the SFOF (see Figure II-6).

The technical functions that provide the analysis, evaluation, and interpretation of spacecraft and/or spacecraft-derived information for Surveyor mission direction and evaluation are performed in the Flight Path Analysis Area (FPAA), in the Mission Support Area (which comprises the Space Science Analysis Area (SSAA) and the Spacecraft Performance Analysis Area (SPAA)), and in the Spacecraft Television Analysis Area (STAA). Use of the STAA will be shared with the Lunar Orbiter Project. Layout of the SSAA and STAA is shown in Figure II-7. The SPAA is illustrated in Figure II-8, and the FPAA in Figure II-9.

Normally, the technical functions are performed in the three areas just stated. However, the Operations Area may, at the discretion of the SFOD, be used for this purpose during the critical phases of the mission that require close coordination between technical and operational personnel, and between the SFOD and the Project Manager.

In standard operations, all commands to the Surveyor spacecraft will originate in, and be controlled from the SFOF. Approval of the SFOD will be required before any commands or sequences of commands are transmitted from the SFOF and/or DSIF to the spacecraft.

Each technical area of the SFOF will be provided with a remote inquiry station of the Data Processing System, including a remote I/O console with an associated administrative printer and card reader to permit direct usage of the Data Processing System from the technical areas. An SC 3070 high-speed printer will also be provided as well as an 11" x 17" Dymec plotter and a 30" x 30" Milgo plotter to display the output of the Data Processing System. An appropriate number of receive-only teletype page printers and reperforators will be provided in each technical area to permit display of the data received in the SFOF directly from the teletype lines.

The Television Ground Data Handling System, with equipment on the second floor of the SFOF, will provide the capability for recording spacecraft television data, and will display this data in real time in the SSAA.

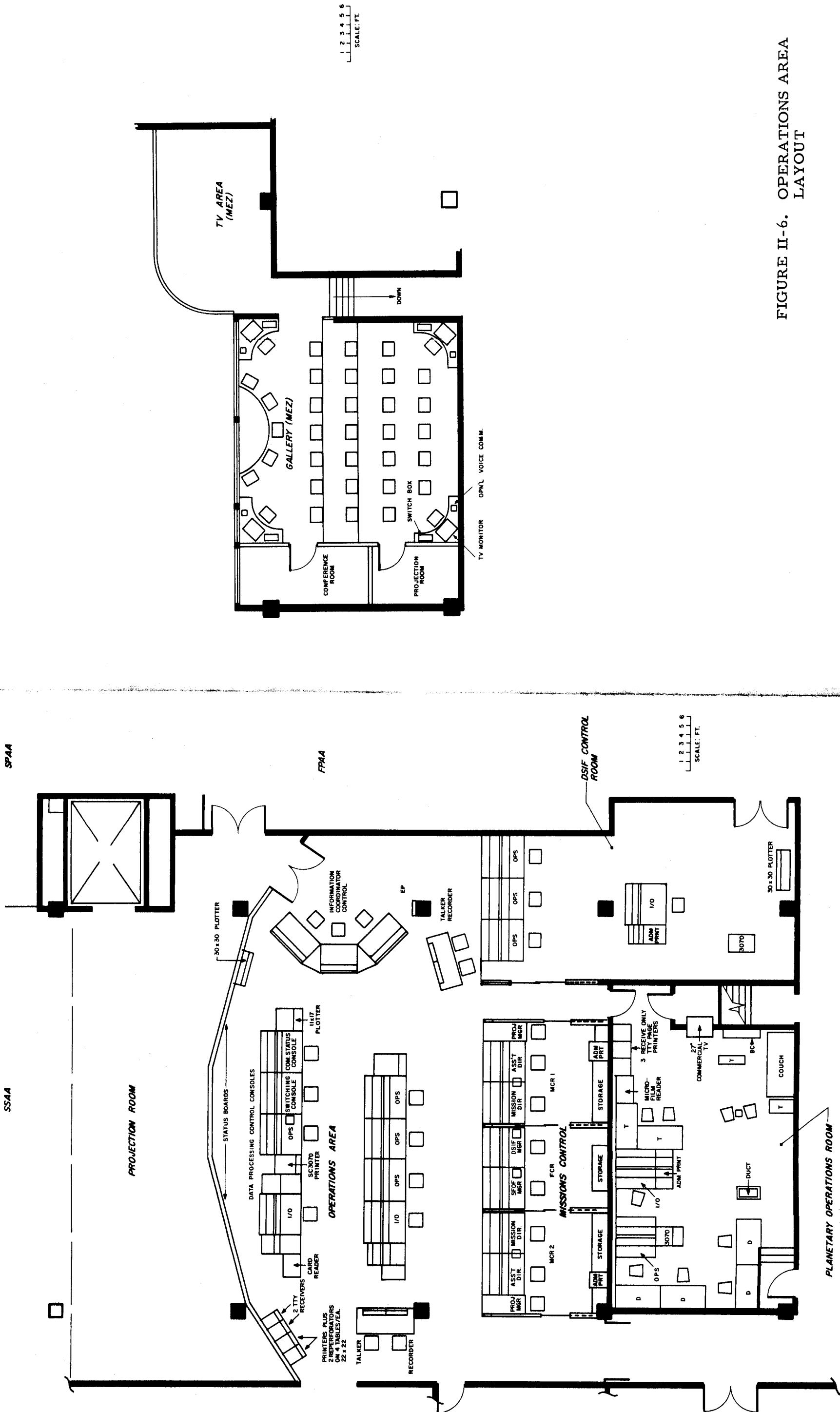


FIGURE II-6. OPERATIONS AREA LAYOUT

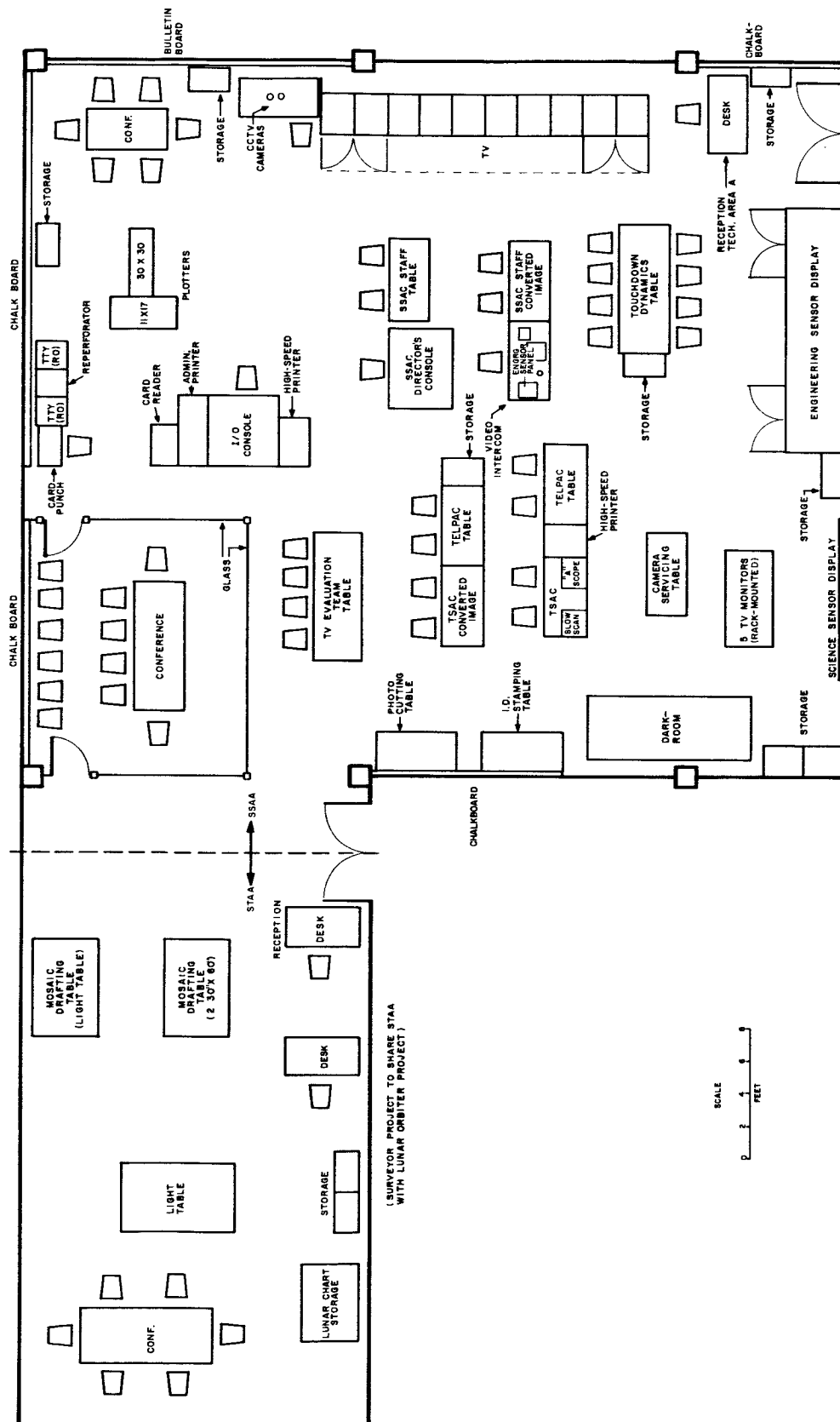


FIGURE II-7. LAYOUT OF SPACE SCIENCE ANALYSIS AREA AND SPACECRAFT TELEVISION ANALYSIS AREA

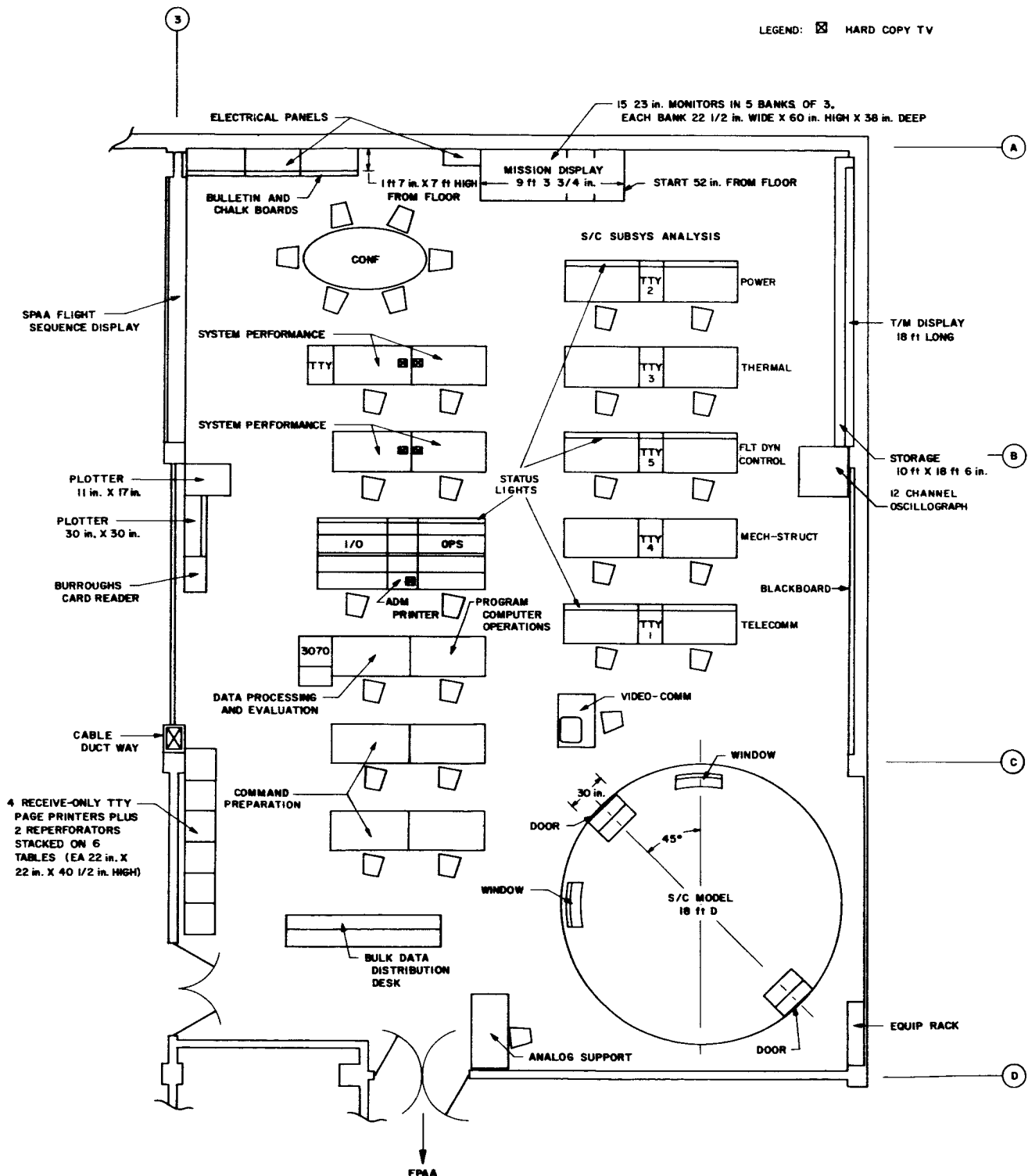


FIGURE II-8. SPACECRAFT PERFORMANCE ANALYSIS AREA LAYOUT

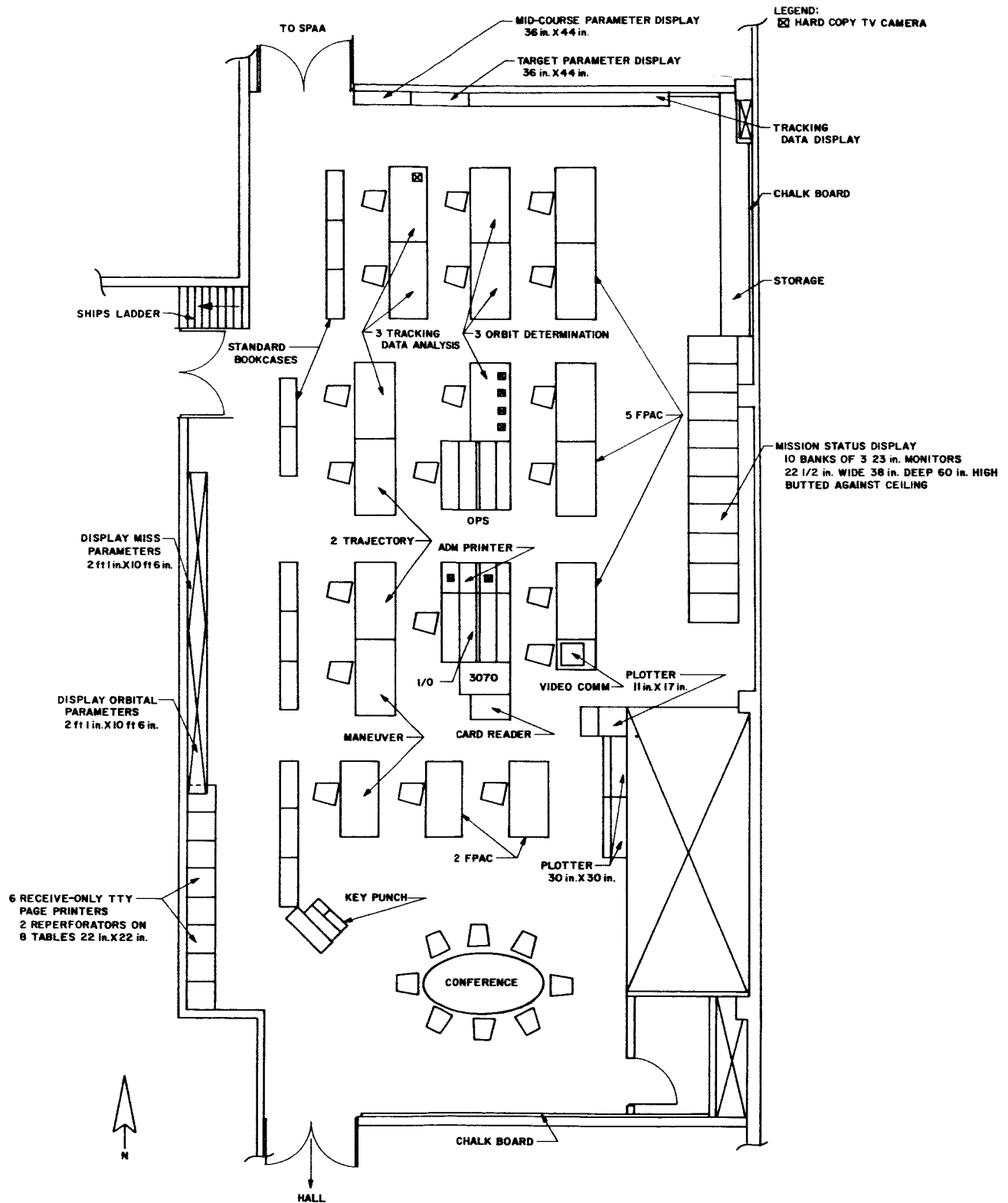


FIGURE II-9. FLIGHT PATH ANALYSIS AREA LAYOUT

The DSIF Net Control Room is located on the first floor of the SFOF, adjacent to the Operations Area (see Figure II-6). Operation of the DSIF is controlled and coordinated from this room. A remote inquiry station of the Data Processing System and a substation of the SFOF Communications System are located in the DSIF Net Control Room to permit monitoring of the tracking and telemetry data obtained by the Deep Space Network (DSN) for operational purposes. The FPAC provides additional support to the DSIF by monitoring the quality of the tracking data in the FPAA.

### 3. Mission-Independent Functions in the SFOF

The relatively mission-independent functions in the SFOF are located in the operational areas of the SFOF and are divided into four major systems: a) the Data Processing System, b) the Communications System, c) the Display System, and d) the Support System.

#### a. Data Processing System

The Data Processing System (DPS) is located in the Data Processing Area on the second floor of the SFOF (see Figure II-10). The major elements of the DPS are the Computer Subsystem, the Telemetry Processing Station Subsystem, the Data Processing Control and Display Subsystem, and the Programming Subsystem. Use of the DPS and of the remote inquiry stations in the SFOF is controlled from the Data Processing Control Console located in the Operations Area.

#### b. Communications System

All communications utilized during the Surveyor space flight operations terminate in the Communications Area in the SFOF. All incoming and outgoing voice, teletype, high-speed data, and spacecraft television communications are controlled from, and distributed in the Communications Control Room (see Figure II-11). All internal communications in the SFOF will also be provided by this system.

#### c. Display System

The Display System provides the capability of displaying summary, semidetained, and detailed information about both mission-dependent and mission-independent operations associated with the space flight in the technical and operational areas of the SFOF. The overall status of the Surveyor mission will be maintained on a current basis on the Mission Status Board in the Operations Area.

#### d. Support System

The Support System provides the services required by the technical and operational personnel during the space flight operations. Maintenance laboratories are provided in the basement.

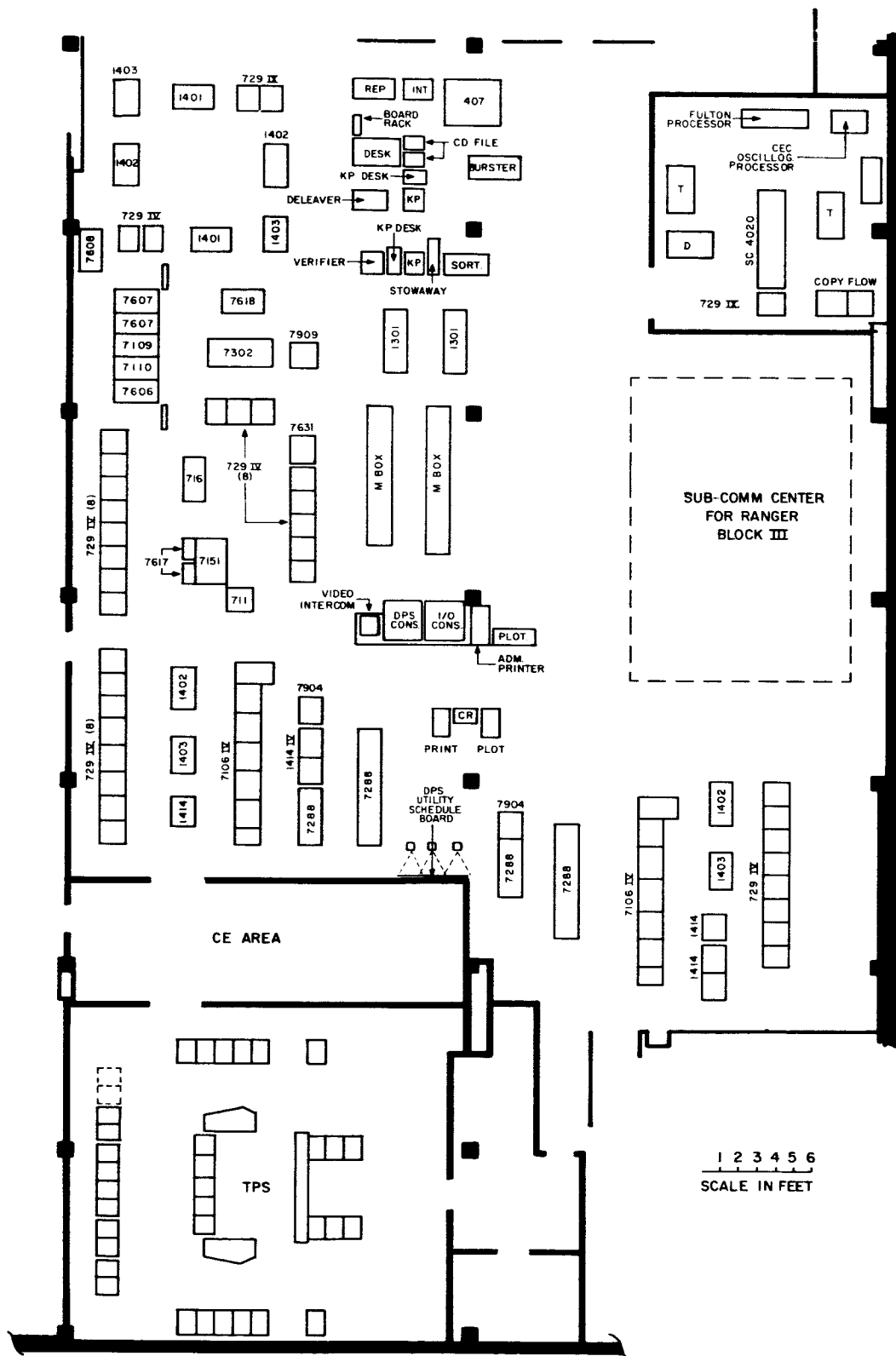


FIGURE II-10. DATA PROCESSING AREA FLOOR PLAN

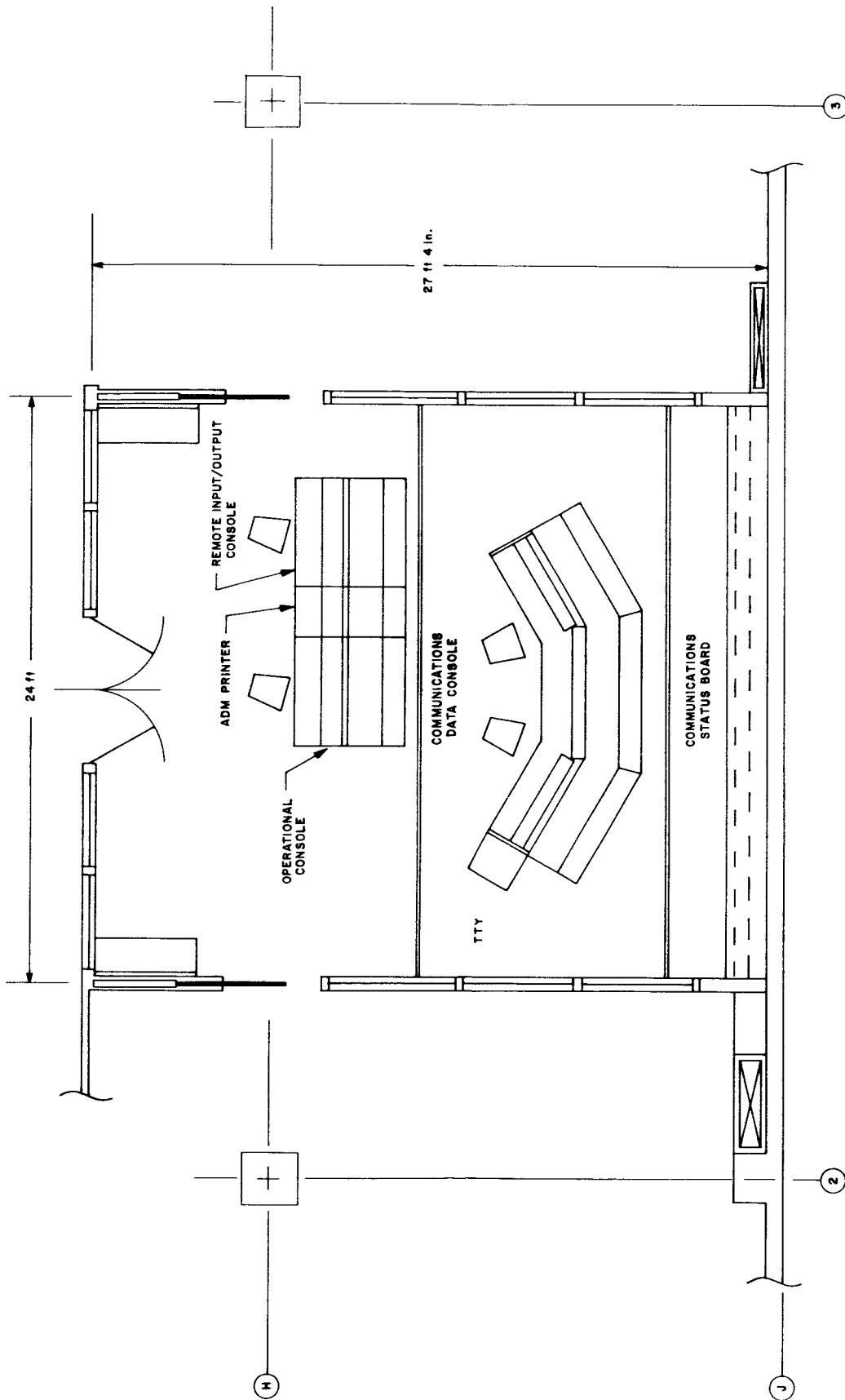


FIGURE II-11. COMMUNICATIONS CONTROL ROOM LAYOUT



A Standby Room and separate men's and women's dormitories are provided on the third floor. The SFOF Document Control Room, located on the third floor, is the central point for the receipt, indexing, and storage of all operational data obtained during the Surveyor mission.

4. Coverage

The SFOF will provide 24-hour-per-day coverage to Surveyor Mission A from launch to the end of the mission. Support, prior to launch, for the Surveyor space flight operations tests, will be provided as required in the Surveyor SFOS schedule.

5. DSN Ground Communications System

The DSN Ground Communications System for Surveyor Mission A is summarized in Table II-IX.

TABLE II-IX. TERRESTRIAL COMMUNICATIONS CAPABILITY AVAILABLE  
TO THE FIRST TWO SURVEYOR MISSIONS

STATION	DIRECTION	FULL-PERIOD VOICE LINES	FULL-PERIOD TTY	HIGH- SPEED DATA	MICROWAVE
Goldstone	To SFOF	2	6	2	60 cps to 6 mc 300 cps to 96 kc
	From SFOF	2	6	0	
Australia	To SFOF	1	3	1*	
	From SFOF	1	3	0	
South Africa	To SFOF	1	3	1**	
	From SFOF	1	3	0	
AFETR	To SFOF	3	3	1*	
	From SFOF	3	3	0	

\* Assumes that all data is encoded to digital form for transmission, and capacity of each line is limited to 1200 bps.

\*\* Assumes that all data is encoded to digital form for transmission, and capacity at the line is limited to 600 bps.

## SECTION III

## DATA FLOW

## A. GENERAL

It is the purpose of this section to describe the flow of data throughout the Space Flight Operations System (SFOS) for the Surveyor Project. This system includes the Air Force Eastern Test Range (AFETR), the Deep Space Instrumentation Facility (DSIF), and the Space Flight Operations Facility (SFOF), all of which are described in Section II.

## B. DATA FLOW

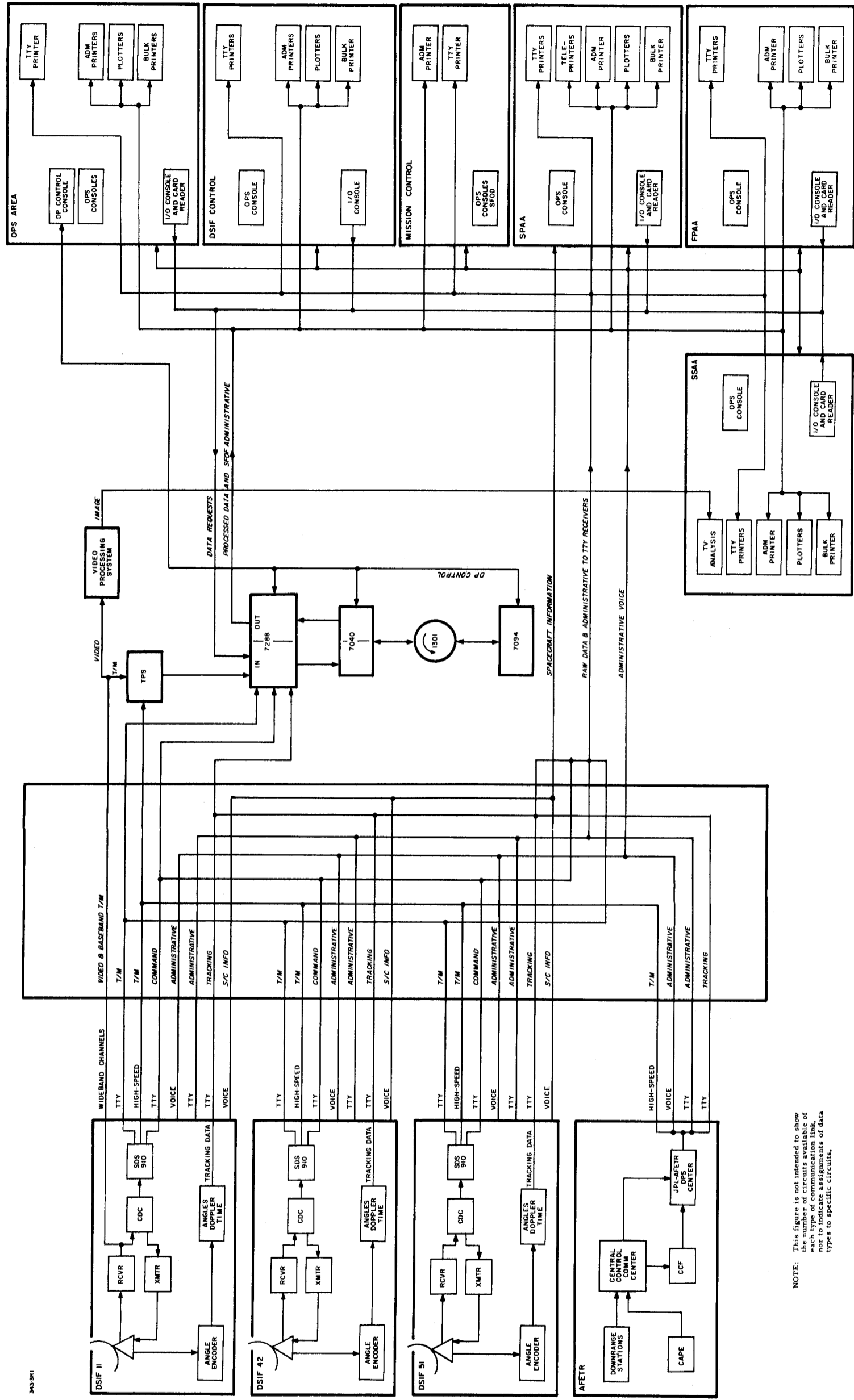
Data from AFETR will be obtained from before launch until after spacecraft/launch vehicle separation. This data will provide the information necessary for spacecraft acquisition by the DSIF stations, for computation of the preliminary spacecraft trajectory, and for preliminary evaluation of spacecraft performance. Data that is obtained from the DSIF will be used for real time monitoring of spacecraft performance and status, for near-real time spacecraft performance and flight path analysis, and for determining spacecraft and flight path commands. This data is transmitted from AFETR and the DSIF to the SFOF where computational processing comprises the major effort in data handling by the SFOF.

The nature of Surveyor space flight operations is such that the flow of data in real time is of prime concern. Figure III-1 indicates the types of data that will be obtained during the flights and the types of communications links over which this data may flow from AFETR and the DSIF to the SFOF. It may be seen in Figure III-1 that varied communications capabilities exist for transmitting data to the SFOF; however, this figure does not show specific line assignments or the number of lines available. Each type of data may be traced to its user in the SFOF. Figure III-2 details the flow of data from the SFOF to the DSIF. This data comprises spacecraft commands, antenna pointing angles, and administrative information. As in Figure III-1, this figure does not attempt to indicate information on-line assignments and priorities.

## C. DATA PROCESSING

Control of data flow and processing is necessary and will be exercised to ensure proper receipt and handling of data at the intervals specified in the Standard Sequence of Events. The principal users of spacecraft and spacecraft-related data, and the types of data primarily used are listed below.

	<u>Group</u>	<u>Type of Data</u>
1)	Spacecraft Performance Analysis and Command	Engineering Telemetry
2)	Flight Path Analysis and Command	Tracking Data



NOTE: This figure is not intended to show the number of circuits available of each type of communication link, nor to indicate assignments of data types to specific circuits.

FIGURE III-1. SURVEYOR DATA FLOW TO CONTROL AND ANALYSIS AREAS IN SFOF

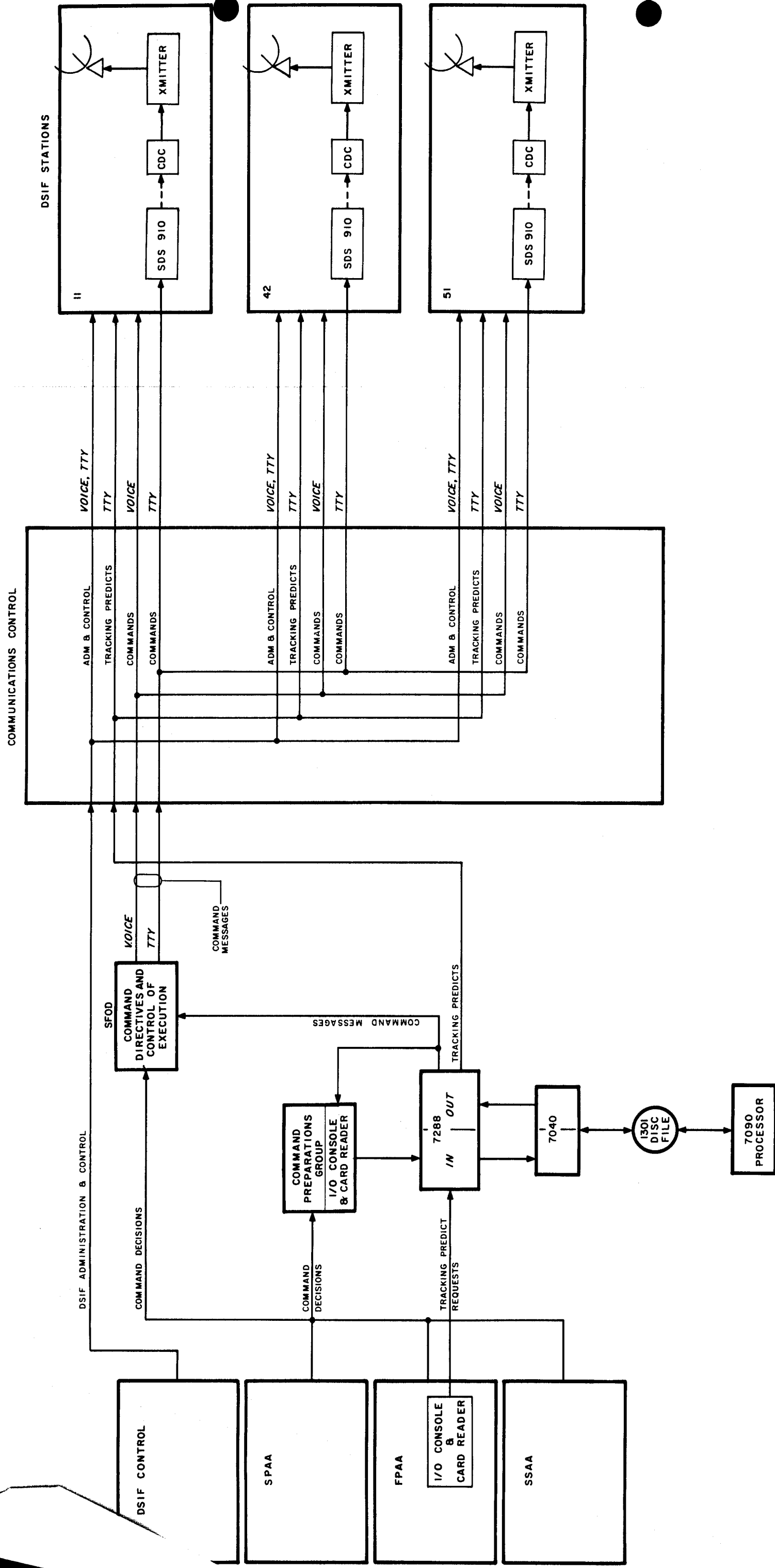


FIGURE III-2. SURVEYOR DATA FLOW FROM SFOF

- |    |                                      |                                |
|----|--------------------------------------|--------------------------------|
| 3) | Space Science Analysis and Command   | Video                          |
| 4) | Mission Control and DSIF Net Control | Summary and Status Information |

It is the responsibility of these groups to interpret, analyze, and evaluate the type of data for which they are cognizant. The type of data and the requirements placed by the users determine the types of computation and processing that are performed. A detailed breakdown of data processing within the SFOF may be found in the Surveyor-SFOF Detailed Operating Procedures (DOPs), EPD-239. Similarly, additional details concerning internal data flow may be obtained from the Surveyor Tracking Instruction Manual (TIM), EPD-\_\_\_ for the DSIF and in the AFETR Program Support Plan (PSP) No. 3400 for Surveyor.

All records of data obtained by the AFETR will be forwarded to:

SFOF Document Control  
Jet Propulsion Laboratory  
4800 Oak Grove Drive  
Pasadena, California

All records of data acquired by the DSIF will be forwarded to the above address within 48 hours of the time of recording.

## SECTION IV

## SPACECRAFT COMMANDS

## A. INTRODUCTION

This section describes the operational aspects of the facilities available for the ground control of the Surveyor spacecraft and states the general procedures for their use in the Surveyor Command System.

Simplification of the spacecraft and increased flexibility of operation during a mission have been gained by holding to a minimum the flight sequences that are preprogrammed into the spacecraft control system. The spacecraft is controlled, to a large extent, by commands transmitted from the ground. Consequently, there is a requirement for a highly developed organization and for operational procedures for the preparation and transmission of commands to the spacecraft.

## B. BASIC DEFINITIONS OF TERMS RELATING TO SURVEYOR SPACECRAFT COMMANDS

1. Command

One of the command words listed in Tables IV-I through IV-VIII (see page IV-14). A command, when received by the spacecraft, produces a particular spacecraft response. Two types of commands are defined:

a) Type 1. Direct Command

A Direct Command produces an immediate spacecraft response. Each such command is uniquely identified by a four-digit octal command number, the first and third digits of which cannot exceed three in value.

b) Type 2. Quantitative Command

A Quantitative Command determines the duration of a particular spacecraft response initiated by a subsequent associated Direct Command. A Quantitative Command is represented by a four-digit, octal number (the first and third digits of which cannot exceed three) having a value determined by the desired time duration of the spacecraft response.

2. Command Sequence

A command or series of commands which, when received by the spacecraft, produces a particular spacecraft response or series of responses. Each command sequence is uniquely identified by a four-digit, octal number.

### 3. Command Message

A statement originating in the SFOF containing commands and/or instructions and concerning the disposition of commands and/or command sequences by the DSIF. Two command message types, which are transmitted only by teletype, are:

- a) Type 1. This results in the production of a CDC command tape at the DSIF.
- b) Type 2. This includes all other teletype command messages.

### 4. Command/Command Sequence/Command Message Return Transmission

The process of transmitting a command/command sequence/command message from the DSIF to the SFOF.

### 5. Command/Command Sequence Execution

The transmission of a command/command sequence from the DSIF to the spacecraft.

### 6. Command Decision

The decision that a particular series of commands be executed at a particular time. (The implementation of this decision is distinct from the decision itself and from the process through which the decision is reached.)

### 7. Command Message Preparation

The process whereby a command message is obtained at the SFOF in the proper representation for transmission to the DSIF. (The process of command message preparation occurs subsequent to, and is distinct from the command decision. It is also distinct from the command message transmission to the DSIF, and the disposition of the command message after transmission.) To establish that the representation so obtained is correct is part of the command preparation.

### 8. Command Request

The request for permission to transmit a command message from the SFOF to the DSIF. This request is directed from a technical area to the SFOD. The command request will normally occur after command preparation is completed.

### 9. Command Directive

The instruction by the SFOD to transmit a command message from the SFOF to the DSIF.

#### 10. Command Verification

A process whereby it is determined at the SFOF whether information at the DSIF pertaining to a command/command sequence/command message is correct. The following examples of command verification are of particular importance:

- a) Verification prior to launch that preprepared command tapes at the DSIF are correct.
- b) Verification that a teletype command message has been correctly received by the DSIF.
- c) Verification that a CDC command tape is in position for execution of the proper command sequence.
- d) Verification that a correct command has been entered on the CDC keyboard, prior to execution.

#### 11. Command Confirmation

The process whereby it is determined at the SFOF whether a command or command sequence has been executed correctly by the DSIF and whether the spacecraft has responded correctly. The following are examples of command confirmation:

- a) Confirmation of correct execution by the DSIF.
- b) Confirmation of correct storage of a Quantitative Command in the spacecraft.
- c) Confirmation of correct spacecraft response to commands or command sequences. This is an indirect process.

#### 12. Command System

The total means, within the Surveyor Space Flight Operations System, available to implement command decisions.

#### 13. Command System Alternative

A preselected subsystem of the command system specified for use in implementing command decisions.

### C. GENERAL POLICY GOVERNING OPERATIONAL PROCEDURES FOR CONTROL AND UTILIZATION OF THE SURVEYOR COMMAND SYSTEM

The general policy formulated for the Operational Procedures to be exercised for the control and utilization of the Surveyor Command System is defined in the following paragraphs.

1. In general, command decisions shall originate within the SFOF. These command decisions shall be originated by, and only by one of the Technical Area Directors (FPAC, SPAC, or SSAC) or by the SFOD. This policy shall apply to command decisions of all types, e. g., decisions resulting in preparation of command messages that will effect generation of command tapes at the DSIF, or decisions resulting in immediate voice direction to the DSIF to execute a particular command sequence. Command decisions may be originated at a DSIF station only in certain specified circumstances; these are governed by the policy set down in Paragraph 4 below.
2. Transmission of teletype command messages (Type 1 and Type 2) from the SFOF to the DSIF shall occur only by Command Directive issued by the SFOD or his designated alternate.
3. Command sequences shall be executed by the DSIF only upon direction of the SFOD or of the proper Technical Area Director. This document details specific responsibilities for this direction. All command sequences required in the standard mission are designated as either major or minor; a minor sequence always occurs as a part of some major sequence; each major sequence comprises one or more minor sequences. Major sequences shall be executed only with the approval of the SFOD. Minor sequences shall be executed only on direction to the DSIF station by the appropriate Technical Area Director, designated in this SFOP for each such sequence.

This policy is effective as long as voice communication exists between the SFOF and the DSIF station in question. The policy for situations in which voice communication does not exist between the SFOF and the DSIF station is stated in Paragraph 4, immediately following.

- 4a. In certain situations, when voice communication does not exist between the SFOF and the DSIF station, it may be necessary that the DSIF station originate the decision to execute command sequences, and carry out this execution without direction from the SFOF. Whenever possible, the appropriate Technical Area Director will specify to the DSIF station by whatever communications are available (e. g., teletype) the particular series of minor sequences to be executed in this manner. These instructions to the DSIF station must be approved by the SFOD.
- 4b. Under certain circumstances, specific directions concerning the sequences to be executed in this manner cannot be provided to the DSIF station from the SFOF. This could occur if all communication with the DSIF station were unexpectedly lost, and were not restored before a critical requirement arose for execution of certain command sequences. In such a situation, the authority of the DSIF station to make command decisions and to execute command sequences shall be as specified in Paragraph 4c immediately following.

- 4c. Requirements for the execution of command sequences are divided into three classes:
- 1) Command sequences the execution of which is required as part of the standard mission.
  - 2) Command sequences the execution of which is required as part of some preplanned, documented, nonstandard procedure.
  - 3) All other command sequences, i. e., command sequences the execution of which might be suggested by the occurrence of any nonstandard situation that has not been specifically documented in this SFOP, either by actual inclusion or by reference herein to another document.

Execution, by the DSIF station, of command sequences in Classes 1) and 2) is permitted only by direction from the SFOF (as described in Paragraph 4a above), or in situations for which this authority is specified in this document. (These situations will be included in a later revision.)

Under no circumstances is the DSIF station to execute commands in Class 3) without specific direction from the SFOF at the time the situation occurs.

5. Command System Alternatives shall be selected only from among those listed in this document; such selection is to be in accordance with the specified requirement for the operational situation encountered.
6. Utilization of Command System Alternatives in standard space flight operations shall be based, in all cases, on appropriate detailed operating procedures that are prepared prior to, and verified during the SFO test phase.
7. The SFOD shall be responsible for interpretation of the details of the general policy stated herein and for the development of a Surveyor Command Procedure based on this policy.

#### D. SPACECRAFT COMMAND SUBSYSTEM

The Surveyor spacecraft command subsystem consists of two identical receivers and two central command decoders (for reliability in the command link) and a set of subsystem decoders, located in the various spacecraft subsystems (e. g., flight control, electrical power). Command information is transmitted to the spacecraft as a binary wavetrain, frequency modulated on a subcarrier that, in turn, phase modulates the DSIF transmitter. The spacecraft receiver recovers the binary wavetrain and routes it to the central command decoder.

The basic command word is 24 bits in length. Two types of commands are transmitted to the spacecraft: Direct and Quantitative. (The command word formats are shown in Figure IV-1. Tables IV-I through IV-VIII list direct command words and the proper spacecraft responses.) Direct Commands, most of which initiate some action by the spacecraft, are identified by a four-digit octal number. The central decoder routes a Direct Command to the subsystem decoder signified by the first two digits of its octal identification. The subsystem decoder then initiates the spacecraft response called out by the last two digits of the octal command number. A Quantitative Command establishes the length of time over which a spacecraft action initiated by a subsequent Direct Command shall occur. Quantitative Commands are routed by the central command decoder to the flight control subsystem decoder for decoding and storage.

As protection against error, the central decoder performs a complement check on Direct Command words as a condition for entry into a subsystem decoder. Quantitative Commands, on the other hand, are immediately retransmitted by the spacecraft to the DSIF for confirmation that they have been correctly stored. So that the spacecraft can maintain bit and word synchronization, fill-in words are transmitted continuously between actual command words. These words have a format similar to that of Direct Commands; however, they violate the complement check and are not entered into subsystem decoders.

#### E. GROUND COMMAND SYSTEM

Figure IV-2 shows, in functional form, the ground portion of the Surveyor Command System. This diagram shows the capabilities for:

- 1) Preparation of command messages
- 2) Transmission to the DSIF
- 3) Entry of commands into the CDC at the DSIF
- 4) Return transmission to the SFOF
- 5) Command verification
- 6) Command confirmation
1. Space Flight Operations Facility (SFOF)

Both the preparation and the verification of long or complex command messages will be implemented in the Data Processing System of the SFOF by means of the SCP and the CVT programs. These programs have the following capabilities:

- a) To make up command messages for output on the communication link to the DSIF. (The Data Processing System has a direct electrical interface with the TTY link in the SFOF.)
- b) To determine internally that the commands so prepared match the command dictionary stored in the Data Processing System disc file.

Bit Numbers	1	4	5	9	10	14	15	19	20	24
Direct Command	Sync Signal		Complement of Subsystem Decoder Address		Subsystem Decoder Address (Binary equiv- alent of first two digits of octal command number)		Complement of Command Designation		Command Designation (Binary equiv- alent of last two digits of octal command num- ber)	
Quantitative Command	Sync Signal		Complement of Address		Address (octal 00)		Magnitude (10-digit binary number)			

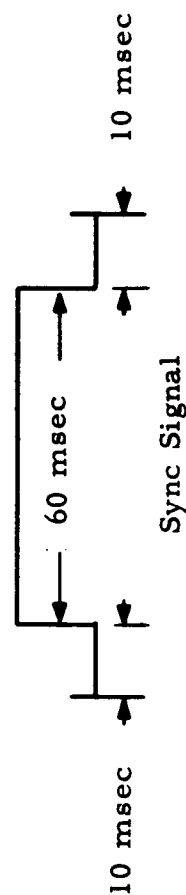


FIGURE IV-1. COMMAND WORD FORMATS

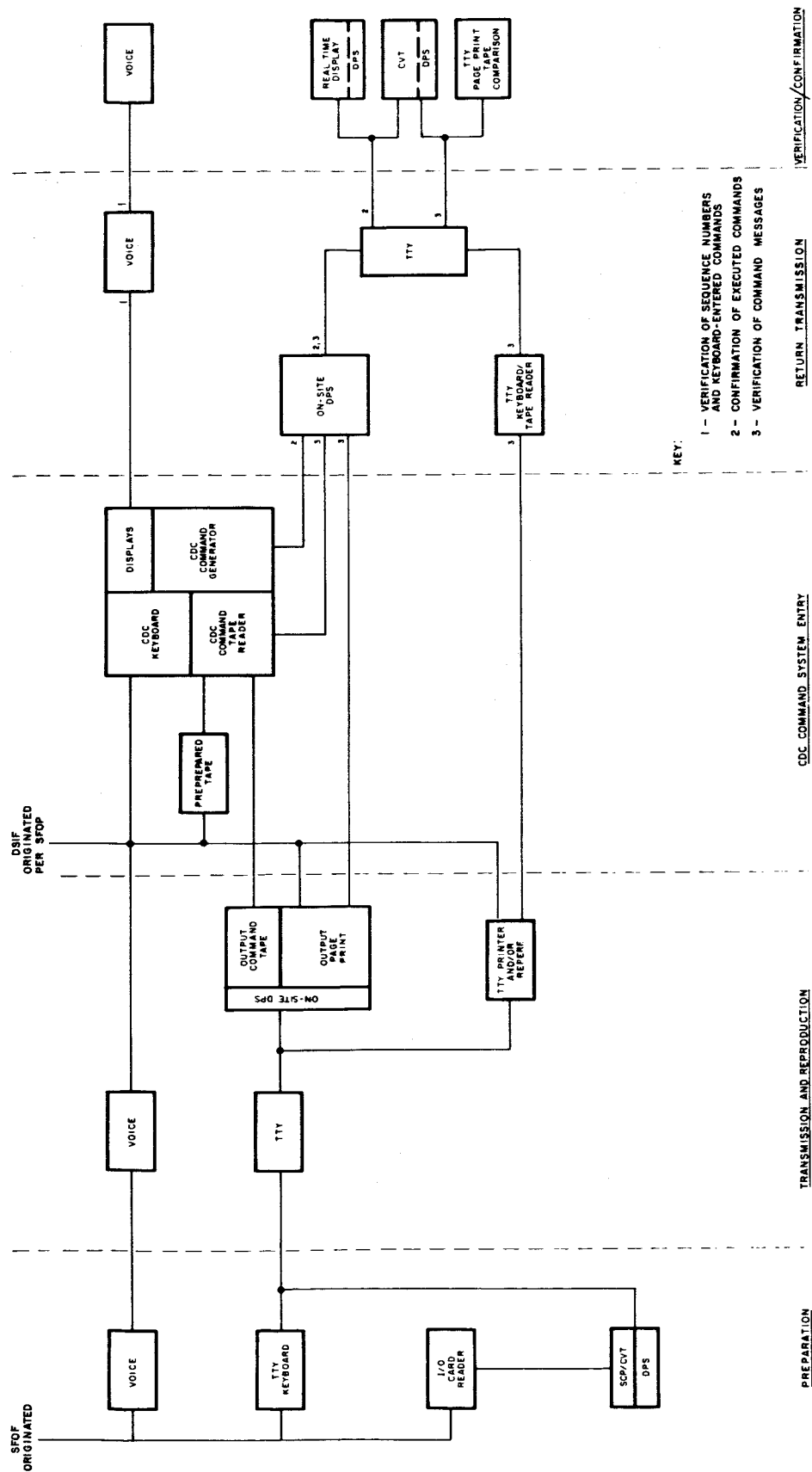


FIGURE IV-2. SURVEYOR COMMAND SYSTEM

- c) To display the command message in the user areas for visual examination.
- d) To verify correct transmission of command messages to the DSIF through bit-by-bit comparison of the return-transmitted and original messages. (Command messages return-transmitted via TTY will also enter the Data Processing System through direct electrical interface with the TTY link.) Any error is indicated and specifically identified by English language output in the technical area displays.
- e) To confirm commands transmitted to the spacecraft through bit-by-bit comparison of executed and original sequences. (This information will also enter the Data Processing System from the TTY link from DSIF through direct electrical interface.)

Additionally, command messages can be prepared for TTY transmission as manually punched TTY paper tape. Command messages can also be transmitted from the SFOF as verbal instruction over voice line. Verification can be implemented, if necessary, by the comparison of English language printouts of transmitted and return-transmitted TTY messages, or by machine comparison of transmitted and return-transmitted TTY tapes.

## 2. Deep Space Instrumentation Facility (DSIF) and Command and Data Handling Console (CDC)

Generation of the command signal that modulates the DSIF transmitter (the modulated subcarrier) is accomplished by the command subsystem of the CDC. Command words are entered in a ten-bit register in the CDC by sequentially depressing four of a set of octal keys, or through a punched mylar tape reader from tapes prepared before the mission or generated from TTY transmission during the mission. The octal command number (or magnitude) is, at this time, displayed on the console for operator examination. In the keyboard entry mode a "transmit" button initiates sequential readout of the register contents to modulate the SCO. The sync signal and the complement bits (in the case of Direct Command words) or address bits (in the case of Quantitative Commands) are generated automatically by the CDC logic. The CDC also generates the fill-in words from "canned" information. There are two modes of tape entry. In the "manual transmit" mode, the tape is advanced one step and a command is transmitted each time a "proceed" button is pressed. In the "automatic transmit" mode, the tape is advanced and commands are transmitted continuously from the time the "proceed" button is pressed until a "stop" button is pressed or a tape programmed stop is reached. The CDC will employ two command tape readers that can alternately be switched into the CDC command register or into the TTY link to the SFOF.

The command tapes contain, besides the command words, additional characters needed for tape control. In particular, command sequences are identified by their sequence numbers. The CDC incorporates an automatic search mode in which the tape reader locates the beginning of any specified command sequence on the tape.

Several features permit close control over any error in transmission to the spacecraft:

- a) Information on the CDC tape can be entered from the CDC tape reader directly onto the TTY link to the SFOF without modulating the DSIF transmitter.
- b) Whenever a command word is transmitted to the spacecraft, the command information is transmitted in real time via TTY to the SFOF.
- c) The command subcarrier is also recorded on magnetic tape at the DSIF station to provide a record of all transmission to the spacecraft.
- d) All commands executed are recorded, with the time of their execution, by the CDC Command Printer.

#### F. COMMAND SYSTEM ALTERNATIVES

Command System Alternatives in space flight operations shall be selected from among Alternative Nos. 1, 2, and 3 defined below. The selection will be as specified for the operational situation encountered.

##### 1. Alternative No. 1

Alternative No. 1 (Figure IV-3) will be used whenever the required command sequence(s) exist on a preprepared tape at the DSIF site.

##### 2. Alternative No. 2

Alternative No. 2 (Figure IV-4) will be used in command situations for which there are no preprepared command tapes. In this mode, the command message will be return-transmitted in its entirety for verification before transmission to the spacecraft is begun.

##### 3. Alternative No. 3

Alternative No. 3 (Figure IV-5) will be used in those situations for which there are no preprepared command tapes and time does not permit use of Alternative No. 2. In this mode, commands are entered in the CDC by Keyboard Entry Mode.

It may be desirable during the mission to use a combination of Alternative Nos. 1 and 3 when the desired command sequence is a minor variation of a sequence that exists on a preprepared tape. The preprepared tape will be entered in the CDC, and special or changed commands will be entered on the CDC keyboard as required.

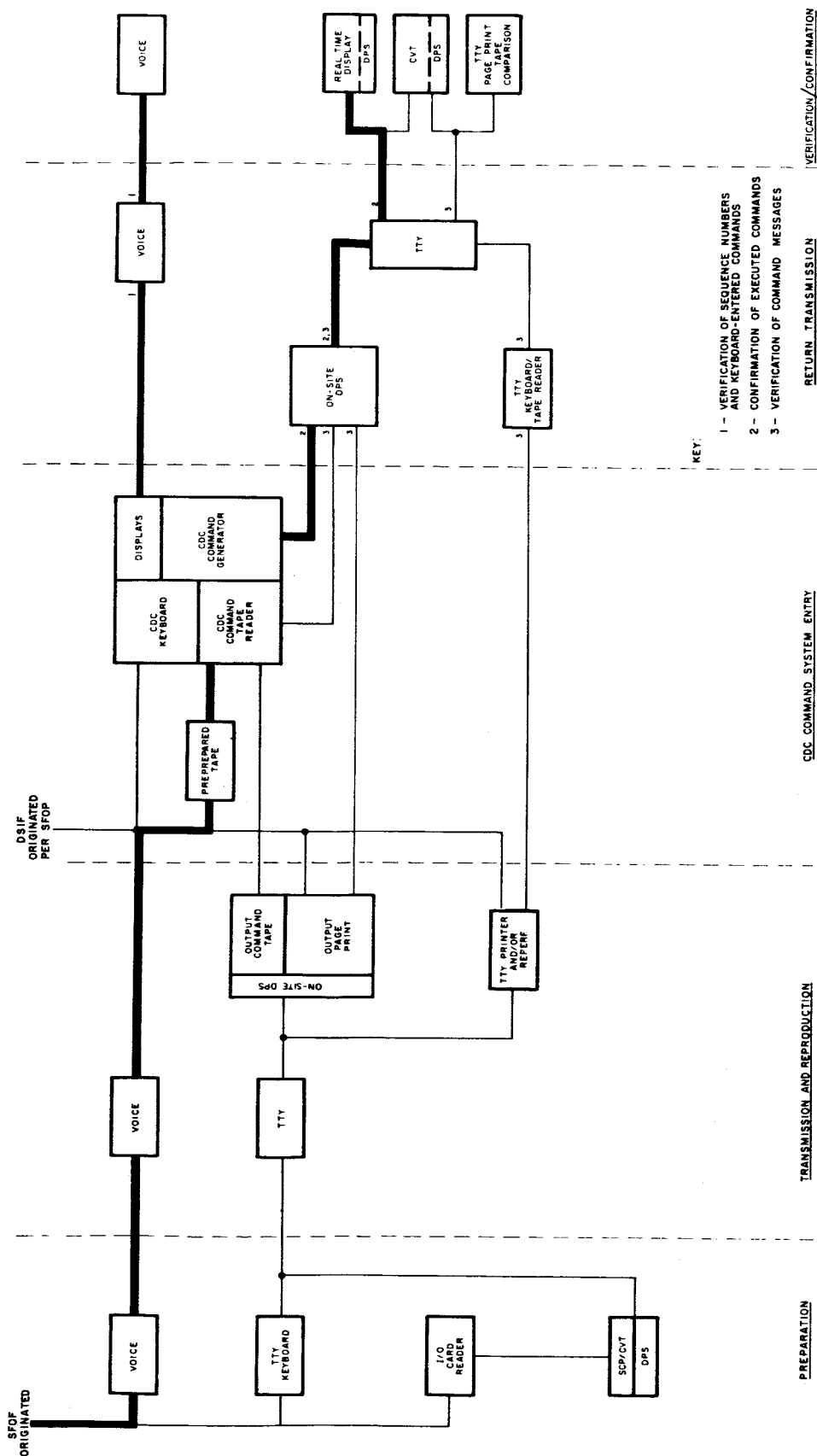


FIGURE IV-3. COMMAND SYSTEM ALTERNATIVE NO. 1

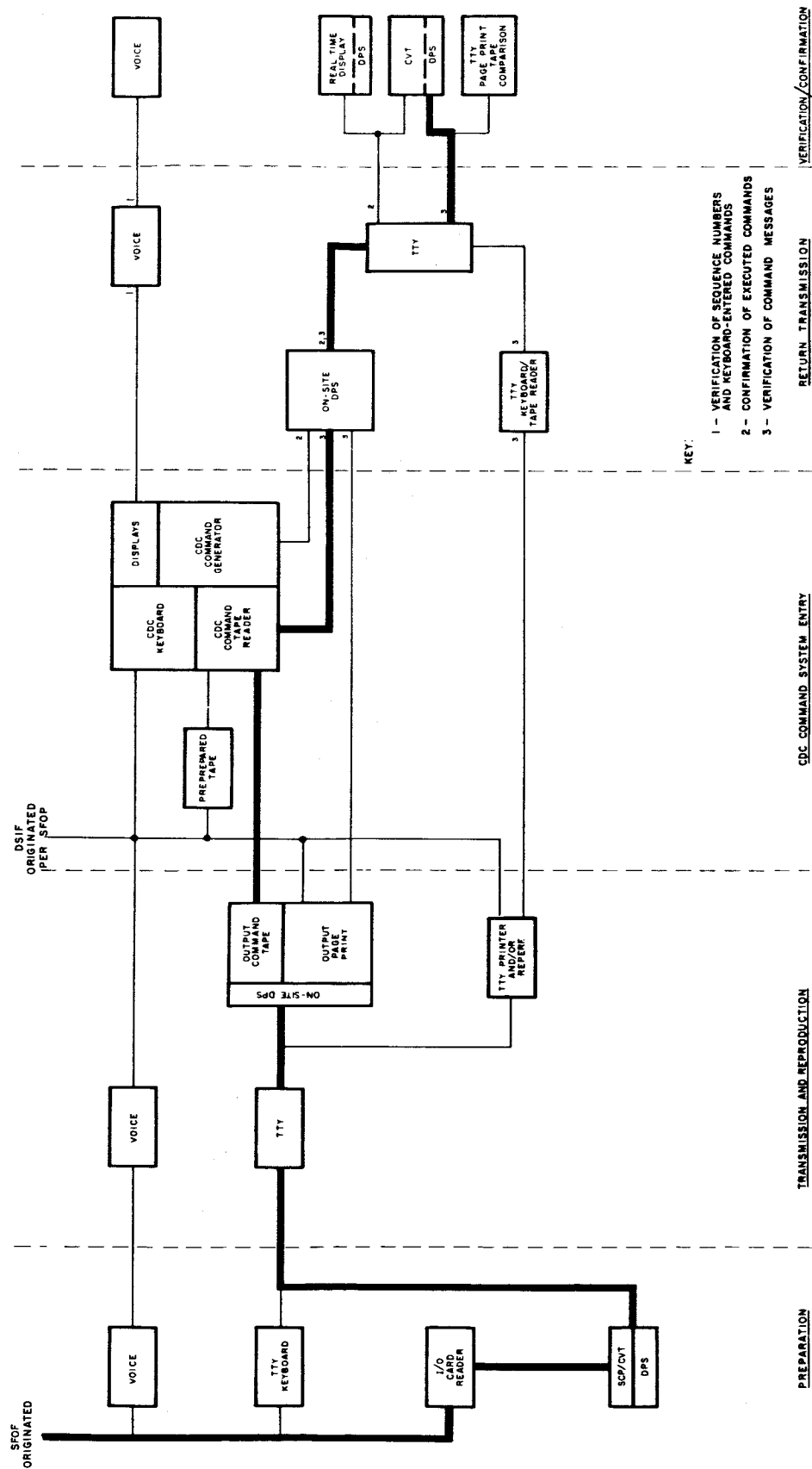


FIGURE IV-4. COMMAND SYSTEM ALTERNATIVE NO. 2

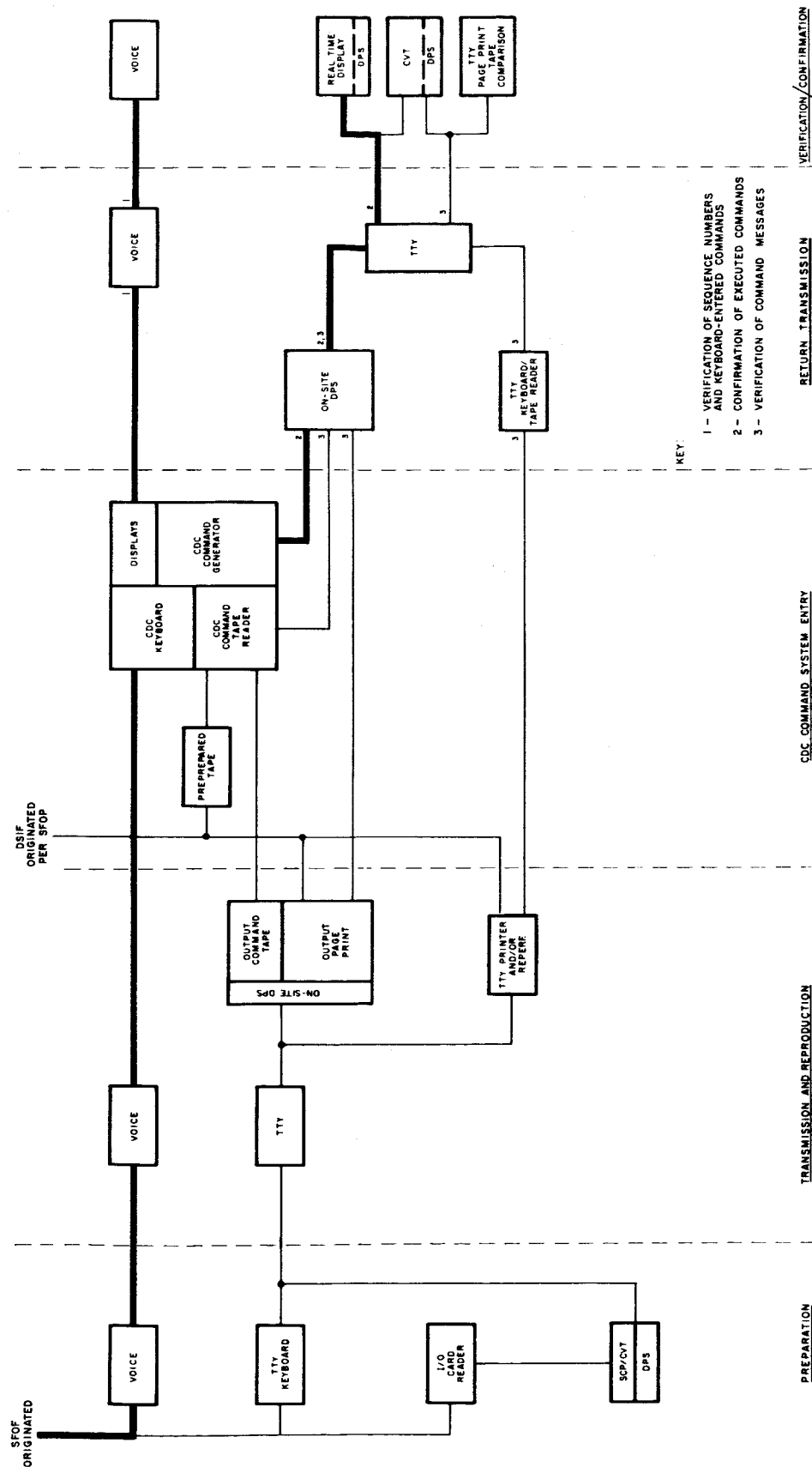


FIGURE IV-5. COMMAND SYSTEM ALTERNATIVE NO. 3

TABLE IV-I. LIST OF DIRECT COMMANDS

DECODER TITLE: DATA LINK AND TV APPROACH CAMERA (NO. 4)

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE (24 Characters)	SPACECRAFT RESPONSE INITIATED
0100	SPARE	
0101	XMTR-A-LOW-PWR-ON	Applies power to Transmitter A for low-power operation in the wide-band (WB) configuration.
0102	XMTR-A-FILA-PWR-ON	Applies filament power to Transmitter A in preparation for high-power operation.
0103	XMTR-A-HI-VOLTS-ON	Applies high voltage only if Commands 0102 and 0125 have been received.
0104	XMTR-B-LOW-PWR-ON	Applies power to Transmitter B for low-power operation in the wide-band configuration.
0105	XMTR-B-FILA-PWR-ON	Applies filament power to Transmitter B in preparation for high-power operation.
0106	XMTR-B-HI-VOLTS-ON	Applies high voltage only if Commands 0105 and 0127 have been received.
0107	XMTR-HI-VOLTS-OFF	Removes high voltage to operating transmitter(s).
0110	XMTR-FILA-PWR-OFF	Removes filament power and high voltage to operating transmitter(s).
0111	XMTR-LOW-PWR-OFF	Removes power to operating transmitter(s) and to VCXO(s).
0112	NARROW-BAND-VCXO-ON	Applies power to NB VCXO, NB phase modulator, and NB amplifier of operating transmitter. Also turns off WB VCXO.

(This table continued on next page.)

TABLE IV-I. (CONT'D)

DECODER TITLE: DATA LINK AND TV APPROACH CAMERA (NO. 4)

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0113	NARROW-BAND-VCXO-OFF	Removes power to operating NB VCXO and allows WB operation.
0114	HI-MOD-GAIN	Increases frequency deviation of main carrier. Used for emergency TV mode.
0115	NORM-MOD-GAIN	Restores normal frequency deviation of main carrier.
0116	XMTR-B-TO-PA	Switches Transmitter B to planar array and Transmitter A to omniantenna.
0117	XMTR-A-TO-PA	Switches Transmitter A to planar array and Transmitter B to omniantenna.
0120	SELECT-OMNI-A	Switches selected transmitter to Omniantenna A.
0121	SELECT-OMNI-B	Switches selected transmitter to Omniantenna B.
0122	XPONDER-A-PWR-ON	Applies power to Transponder A.
0123	XPONDER-B-PWR-ON	Applies power to Transponder B.
0124	XPONDER-PWR-OFF	Removes power to operating transponder(s).
0125	XFR-SW-A-HI-PWR	Switches antenna to output of Transmitter A final power amplifier.
0126	XFR-SW-A-LOW-PWR	Switches antenna to low-power output of Transmitter A.

(This table continued on next page.)

TABLE IV-I, (CONT'D)

DECODER TITLE: DATA LINK AND TV APPROACH CAMERA (NO. 4)

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0127	XFR-SW-B-HI-PWR	Switches antenna to output of Transmitter B final power amplifier.
0130	XFR-SW-B-LOW-PWR	Switches antenna to low-power output of Transmitter B.
0131	VDN-TEMP-CTRL-ON-APR-CAM	Applies power to temperature control system.
0132	PWR-ON-APRCH-CAMERA	Applies power to Camera No. 4 electronics.
0133	STR-FRM-APRCH-CAMERA	Initiates one frame which includes vertical sync and video.
0134	PWR-OFF-APRCH-CAMERA	Removes power to Camera No. 4 electronics.
0135	ALL-TEMP-CTRL-OFF-APR-CM	Removes power to electronics and vidicon temperature control.
0136	ELCT-TEMP-CTRL-ON-APR-CM	Turns on power to Camera No. 4 electronics heater.
0137	SPARE	

TABLE IV-II. LIST OF DIRECT COMMANDS

DECODER TITLE: SIGNAL PROCESSING

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0200	LOW-MOD-INDEX-SCO-ON	Applies power to SCO used for 550 bps transmission following separation and during lunar operation.
0201	A/D-CONV-1-PWR-ON	Applies power to clock and conversion circuitry.
0202	A/D-CONV-2-PWR-ON	Applies power to clock and conversion circuitry.
0203	A/D-CONV-PWR-OFF	Removes power to operating A/D converter.
0204	A/D-COAST-PH-CLK-RATES	Permits bit rate selection of 17.2 bps (OCT.0505), 137.5 bps (OCT.0504), or 550 bps (OCT.0503).
0205	A/D-CLK-RATE-11 $\phi\phi$ -BPS	Selects bit rate of 1100 bits per second (100 words per second, 11 bits per word).
0206	A/D-CLK-RATE-44 $\phi\phi$ -BPS	Selects bit rate of 4400 bits per second (400 words per second, 11 bits per word).
0207	PRE-SUM-AMP-ON	Applies power to PM presuming amplifier.
0210	PHSE-SUM-AMP-A-ON	Applies power to amplifier required to phase modulate Transmitter A.
0211	PHSE-SUM-AMP-B-ON	Applies power to amplifier required to phase modulate Transmitter B.
0212	FREQ-SUM-AMP-A-ON	Applies power to amplifier required to frequency modulate Transmitter A.

(This table continued on next page.)

TABLE IV-II. (CONT'D)

DECODER TITLE: SIGNAL PROCESSING

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0213	FREQ-SUM-AMP-B-ON	Applies power to amplifier required to frequency modulate Transmitter B.
0214	SUM-AMP-OFF	Removes power to presumming, phase and frequency summing amplifiers.
0215	3.9 KC-A/D-SCO-ON	Applies power to SCO normally used for 550 bps transmission.
0216	7.35 KC-A/D-SCO-ON	Applies power to SCO normally used for 1100 bps transmission.
0217	33 KC-A/D-SCO-ON	Applies power to SCO normally used for 4400 bps transmission.
0220	33, 7.35, 3.9 KC-SCOS-OFF	Removes power to SCO's and isolation amplifier used for transmission of A/D output.
0221	GYRO-SPEED-SIG-PROC-ON	Applies power to signal processor used for transmission of gyro speeds.
0222	SELECT-NEXT-GYRO-SPD-CNL	Selects roll, pitch, or yaw gyro speed.
0223	GYRO-SPD-SIG-PROC-OFF	Removes power to signal processor for gyro speed data.
0224	BASIC-BUS-ACCEL-CNLS-ON	Applies power to SCO's and presumming amplifier used to transmit accelerometer data.
0225	BASIC-BUS-ACCEL-CNLS-OFF	Removes power to SCO's and amplifier used to transmit accelerometer data.

(This table continued on next page.)

TABLE IV-II. (CONT'D)

DECODER TITLE: SIGNAL PROCESSING

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0226	ENGR-CMTR-1-ON	Applies power to commutator containing data required for midcourse correction.
0227	ENGR-CMTR-2-ON	Applies power to commutator required during terminal descent when transmitting on planar array.
0230	ENGR-CMTR-3-ON	Applies power to commutator required during terminal descent when transmitting on omniantenna.
0231	ENGR-CMTR-4-ON	Applies power to commutator containing data required during acquisition and lunar operation.
0232	ENGR-CMTRS-OFF	Removes power to all engineering commutators.
0233	CMD-REJ/ENBL-SCO-ON	Applies power to reject/enable SCO to allow real time monitoring via FM/FM channel.
0234	CMD-REJ/ENBL-SCO-OFF	Removes power from reject/enable SCO.
0235	A/D-ISOLTN-AMP-ON	Applies power to isolation amplifier to provide A/D output via Centaur telemetry.
0236	A/D-ISOLTN-AMP-OFF	Removes power from A/D isolation amplifier.
0237	LOW-MOD-INDEX-SCO-OFF	Removes power from SCO used for 550 bps transmission following separation and during lunar operation.

TABLE IV-III. LIST OF DIRECT COMMANDS

DECODER TITLE: ELECTRICAL POWER

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0300	FLT-CTRL-COAST-PZ-PWR-ON	Applies power to flight control circuits for Coast Phase attitude control.
0301	ENBLE-BATT-PRESS-LOGIC	Allows battery charging to be discontinued if battery manifold pressure exceeds 65 psi.
0302	DSBLE-BATT-PRESS-LOGIC	Disables battery pressure logic to permit battery charging.
0303	SPARE	
0304	BYPS-MN-OTC	Bypasses overcurrent sensing circuitry in nonessential regulated bus.
0305	ENBLE-MN-OTC	Applies power to nonessential regulated bus via overcurrent sensing circuitry.
0306	OCR-ON-&-BYPS-OFF	Applies power to OCR to maximize power transfer from solar panel to battery.
0307	OCR-BYPS-ON-&-OCR-OFF	Bypasses OCR to permit charging at reduced efficiency but at lower compartment dissipation.
0310	OCR-OFF	Turns off OCR and removes solar panel from power system.
0311	ALL-FLT-CTRL-PWR-OFF (I)	Removes power from flight control regulated and unregulated.
0312	SPARE	
0313	SPARE	
0314	NON-ESSEN-LOADS-OFF (I)	Removes power from nonessential regulated bus.

(This table continued on next page.)

TABLE IV-III. (CONT'D)

DECODER TITLE: ELECTRICAL POWER

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0315	SPARE	
0316	SPARE	
0317	AUX-BATT-MODE-ON	Connects main and auxiliary batteries to unregulated bus through isolation diodes.
0320	RESTORE-MAIN-BATT-MODE	Connects main battery directly to unregulated bus and removes auxiliary battery diode connection.
0321	DSBLE-BATT-XFR-LOGIC	Disables logic which switches system to auxiliary battery mode at low main battery voltage.
0322	HI-CUR-MODE-ON	Connects auxiliary battery directly to unregulated bus.
0323	HI-CUR-MODE-OFF	Removes direct connection between auxiliary battery and unregulated bus.
0324 to 0337	SPARE	

TABLE IV-IV. LIST OF DIRECT COMMANDS  
 DECODER TITLE. MECHANISMS AND VEHICLE

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0400	SPARE	
0401	STEP-SOLAR-PANEL-PLUS	Pulses stepping motor to move solar panel +0.125 degrees.
0402	STEP-SOLAR-PANEL-MINUS	Pulses stepping motor to move solar panel -0.125 degrees.
0403	STEP-POLAR-AXIS-PLUS	Pulses stepping motor to move polar axis +0.125 degrees.
0404	STEP-POLAR-AXIS-MINUS	Pulses stepping motor to move polar axis -0.125 degrees.
0405	STEP-ROLL-AXIS-PLUS	Pulses stepping motor to move roll axis +0.125 degrees.
0406	STEP-ROLL-AXIS-MINUS	Pulses stepping motor to move roll axis -0.125 degrees.
0407	STEP-ELEV-AXIS-PLUS	Pulses stepping motor to move elevation axis +0.125 degrees
0410	STEP-ELEV-AXIS-MINUS	Pulses stepping motor to move elevation axis -0.125 degrees.
0411	COMPT-A-HTR-PWR-ON	Supplies power directly to Compartment A heater.
0412	COMPT-A-THRM-CTRL-AUTO	Supplies power to Compartment A heater through a proportional control.
0413	COMPT-A-HTR-PWR-OFF	Removes heater power.
0414	COMPT-B-HTR-PWR-ON	Supplies power directly to Compartment B heater.

(This table continued on next page.)

TABLE IV-IV. (CONT'D)

DECODER TITLE: MECHANISMS AND VEHICLE

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0415	COMPT-B-THRM-CTRL-AUTO	Supplies power to Compartment B heater through a proportional control.
0416	COMPT-B-HTR-PWR-OFF	Removes heater power.
0417 to 0437	SPARE	

TABLE IV-V. LIST OF DIRECT COMMANDS

DECODER TITLE: ENGINEERING PAYLOAD

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0500	COAST-PH-I-A/D-SCO-ON	Applies power to SCO normally used for 137.5 bps transmission.
0501	COAST-PH-II-A/D-SCO-ON	Applies power to SCO normally used for 17.2 bps transmission.
0502	COAST-PH-A/D-SCO-OFF	Removes power from Coast Phase I and Coast Phase II A/D SCO's.
0503	A/D-CLOCK-RATE-55 $\phi$ -BPS	Selects bit rate of 550 bits per second (50 words per second, 11 bits per word).
0504	A/D-CLOCK-RATE-137.5-BPS	Selects bit rate of 137.5 bits per second (12.5 words per second, 11 bits per word).
0505	A/D-CLOCK-RATE-17.2-BPS	Selects bit rate of 17.2 bits per second (1.56 words per second, 11 bits per word).
0506	COAST-PH-CMTR-ON	Applies power to commutator required for Coast Phase.
0507	TRST-PH-BACK-UP-CMTR-ON	Applies power to backup commutator in case of failure of commutators 1, 2, 3 during mid-course correction or terminal descent.
0510	AUX-CMTR-OFF	Turns off power to Coast Phase commutator and Thrust Phase backup commutator.
0511	AUX-ACCEL-AMP-ON	Applies power to four accelerometer amplifiers: one near Compartment A, one near B and two on solar panel mast.

(This table continued on next page.)

TABLE IV-V. (CONT'D)

DECODER TITLE: ENGINEERING PAYLOAD

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0512	AUX-ACCEL-AMP-OFF	Removes power to four auxiliary accelerometer amplifiers turned on by Octal Command 0511.
0513	AUX-ACCEL-DATA-CHAN-ON	Applies power to presumming amplifier and two SCOs used to transmit auxiliary accelerometer data.
0514	AUX-ACCEL-DATA-CHAN-OFF	Removes power to amplifier and SCOs used to transmit auxiliary accelerometer data.
0515	TD-STRN-GA-PWR-ON	Applies power to three shock absorber strain gage amplifiers.
0516	TD-STRN-GA-PWR-OFF	Removes power from three shock absorber strain gage amplifiers.
0517	TD-STRN-GA-DATA-CHNL-ON	Applies power to presumming amplifier and three SCOs used to transmit shock absorber strain gage data.
0520	TD-STRN-GA-DATA-CHNL-OFF	Removes power from amplifier and SCOs used to transmit shock absorber strain gage data.
0521	PROPUL-STRN-GA-PWR-ON	Applies power to three thrust-level strain gage amplifiers, one for each vernier engine.
0522	PROPUL-STRN-GA-PWR-OFF	Removes power to three thrust-level strain gage amplifiers.
0523 to 0537	SPARE	

TABLE IV-VI. LIST OF DIRECT COMMANDS

DECODER TITLE: ENGINEERING MECHANISMS AUXILIARY

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0600	EXTEND-LANDING-GEAR	Energizes squib-actuated pin-pullers to extend landing gear (normally actuated from Centaur).
0601	EXTEND-OMNI-ANTENNAS	Energizes squib-actuated pin-pullers to release boom latches (normally actuated from Centaur).
0602	SPARE	
0603	DUMP-NITROGEN-(I)	Energizes squib-actuated nitrogen dump valve.
0604	AMR-HTR-OFF	Removes AMR heater power.
0605	SPARE	
0606	SPARE	
0607	PRESSURE-VERNIER-SYS-(I)	Energizes squib-actuated helium release valve.
0610	DUMP-HELIUM-(I)	Energizes squib-actuated helium dump valve.
0611	VER-LINES-2-TCP-ON	Applies heater power to maintain temperature of Vernier Lines No. 2.
0612	VER-FUEL-TANK-2-TCP-ON	Applies heater power to maintain temperature of Vernier Fuel Tank No. 2.
0613	VL-2-&-VFT-2-TCP-OFF	Removes heater power from Vernier Lines No. 2 and Vernier Fuel Tank No. 2.

(This table continued on next page.)

TABLE IV-VI. (CONT'D)

DECODER TITLE: ENGINEERING MECHANISMS AUXILIARY

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0614	VER-LINES-1-TCP-ON	Applies heater power to maintain temperature of Vernier Lines No. 1.
0615	VER-OXDZ-TANK-2-TCP-ON	Applies heater power to maintain temperature of Vernier Oxidizer Tank No. 2.
0616	VL-1-&-VOT-2-TCP-OFF	Removes heater power from Vernier Lines No. 1 and Vernier Oxidizer Tank No. 2.
0617	VER-LINES-3-TCP-ON	Applies heater power to maintain temperature of Vernier Lines No. 3.
0620	VER-OXDZ-TANK-3-TCP-ON	Applies heater power to maintain temperature of Vernier Oxidizer Tank No. 3.
0621	VL-3-&-VOT-3-TCP-OFF	Removes heater power from Vernier Lines No. 3 and Vernier Oxidizer Tank No. 3.
0622	BB-ACCEL-AMPS-ON	Applies power to four accelerometer amplifiers.
0623	BB-ACCEL-AMPS-OFF	Removes power to accelerometer amplifiers turned on by Octal Command 0622.
0624	AMR-HTR-ON	Applies power to preheat AMR package.
0625	AMR-PWR-ON	Applies "warm-up" power to AMR.

(This table continued on next page.)

TABLE IV-VI. (CONT'D)

DECODER TITLE: ENGINEERING MECHANISMS AUXILIARY

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0626	ENABLE-AMR	"Operate" command to altitude marking radar.
0627	AMR-PWR-OFF-(I)	Removes power from AMR.
0630	RADVS-PWR-OFF-(I)	Energizes pyrotechnic switches which remove power from RADVS.
0631	UNLOCK-SOLAR-PANEL-(T)	Energizes squib-actuated pin-pullers to permit positioning of solar panel.
0632	UNLK-MAST-ROLL-AX	Energizes squib-actuated pin-pullers to permit mast roll axis positioning.
0633	SPARE	
0634	UNLK-ELEV-AXIS	Energizes squib-actuated pin-pullers to permit positioning of elevation axis.
0635	UNLK-SP-(L)	Energizes squib-actuated pin-pullers to permit positioning of solar panels.
0636	LOCK-LANDING-GEAR	Energizes squib-actuated locking mechanism to hold landing gear rigid.
0637	RADVS-PWR-ON-(I)	Energizes pyrotechnic switches which apply power to RADVS.

TABLE IV-VII. LIST OF DIRECT COMMANDS

DECODER TITLE: FLIGHT CONTROL

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0700	INERTIAL-MODE-ON	Output Sets I, II, and III are reset to provide inertial reference.
0701	RATE-LOCK-MODE-ON	Stops motion in all three spacecraft axes (roll, pitch, and yaw).
0702	SUN-ACQ-MODE-ON	Initiates automatic search in pitch and yaw to align roll axis with Sun.
0703	SUN-&-STAR-ACQ-MODE-ON	Initiates automatic search in roll to acquire Canopus after 0702.
0704	CRUISE-MODE-ON	Provide Sun and star lock-on or inertial reference if lock-on signals are absent.
0705	EMER-P-PRECESS-ENABLE	Performs function of pitch precession enable in case of emergency.
0706	ENABLE-GAS-JET-AMPS	Enables gas jet amplifiers in case of emergency.
0707	INHIBIT-GAS-JET-AMPS	Inhibits gas jet amplifiers in case of an emergency.
0710	POS-ANGLE-MANEUVER	Establishes polarity of attitude commands.
0711	ROLL	Initiates roll attitude maneuver preset by Quantitative Command.
0712	PITCH	Initiates pitch attitude maneuver preset by Quantitative Command.
0713	YAW	Initiates yaw attitude maneuver preset by Quantitative Command.
0714	SUN-&-ROLL	Maintains Sun lock-on and initiates roll attitude maneuver.

(This table continued on next page.)

TABLE IV-VII. (CONT'D)

DECODER TITLE: FLIGHT CONTROL

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0715	MANUAL-DELAY-MODE-ON	Prepares programmer to accept ground-controlled time interval.
0716	SPARE	
0717	SPARE	
0720	RESET-SET-IV-OUTPUTS	Resets Set IV outputs.
0721	MVC-OR-EVI-(I)	Initiates velocity increment correction corresponding to the stored magnitude.
0722	SELECT-NOM-THRUST-BIAS	Reduces thrust of vernier engines from 200 lb. total to 150 lb. total.
0723	RESET-NOM-THRUST-BIAS	Increases the thrust of vernier engines to nominal 200 lb. total.
0724	RETRO-SEQ-MODE-ON-(I)	Enables Set IV outputs and AMR signal.
0725	SPARE	
0726	SPARE	
0727	FLT-CTRL-TRST-PHZ-PWR-ON	Applies power to flight control circuits required for control of verniers and retro.
0730	EMER-AMR-SIG	Performs function of AMR signal in case of emergency.
0731	EMER-RETRO-IGN	Commands Flight Control Programmer to deliver retro ignition signal.
0732	EMER-RETRO-EJECT	Commands Flight Control Programmer to deliver retro eject and sets burnout latch circuit.

(This table continued on next page.)

TABLE IV-VII. (CONT'D)

DECODER TITLE: FLIGHT CONTROL

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
0733	EMER-START-PGRMD-THRUST	Sets delayed--post-burnout latch circuit, enabling vernier programmed thrust.
0734	EMER-RADVS-ON-SIG	Performs function of RADVS "on" signal in case of emergency.
0735	EMER-VENT-VERN-ENG-SIG	Performs function of vernier engine purge signal in case of emergency.
0736	TERM-VERN-ENG-VENT	Resets vernier engine purge latch circuit to terminate 5-min. engine purge cycle.
0737	THRUST-PHZ-PWR-OFF	Removes power to flight control circuits required for control of verniers and retro.

TABLE IV-VIII. LIST OF DIRECT COMMANDS

DECODER TITLE: TELEVISION SURVEY CAMERA (NO. 3)

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
1100	START-FRAME	Gates logic to initiate video transmission.
1101	SPARE	
1102	SPARE	
1103	SURVEY-CAMERA-PWR-ON	Turns on power to Camera No. 3.
1104	SURVEY-CAMERA-PWR-OFF	Turns off power to TV system electronics for Survey Camera.
1105	SHUTTER-NORM	Returns shutter to normal mode.
1106	SHUTTER-OPEN	Opens shutter under minimal light conditions.
1107	EMER-MODE-ON	Selects emergency scan rates and amplitude.
1110	SET-25-MM-FOCAL-LGTH	Energizes motor to drive lens assembly to 25mm focal length
1111	SET-100-MM-FOCAL-LGTH	Energizes motor to drive lens assembly to 100mm focal length.
1112	IRIS-SERVO-ON	Iris servo loop closed to control f-stop automatically, provided iris is not at extreme setting.
1113	STEP-IRIS-OPEN	Pulses stepper motor to open iris one f-stop if iris servo loop is open.
1114	STEP-IRIS-CLOSED	Pulses stepper motor to close iris one f-stop if iris servo loop is open.

(This table continued on next page.)

TABLE IV-VIII. (CONT'D)

DECODER TITLE: TELEVISION SURVEY CAMERA (NO. 3)

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
1115	STEP-MIRROR-RIGHT	Pulses stepper motor to move mirror 3 degrees in azimuth to right.
1116	STEP-MIRROR-LEFT	Pulses stepper motor to move mirror 3 degrees in azimuth to left.
1117	2-STEPS-MIRROR-RIGHT	Pulses stepper motor to move mirror 6 degrees to right.
1120	2-STEPS-MIRROR-LEFT	Pulses stepper motor to move mirror 6 degrees to left.
1121	STEP-MIRROR-DOWN	Pulses stepper motor to move mirror 2.5 degrees down in elevation.
1122	STEP-MIRROR-UP	Pulses stepper motor to move mirror 2.5 degrees up in elevation.
1123	STEP-FOCUS-IN	Pulses stepper motor one step in (focus range: $\infty$ to 6 ft. in 50 steps).
1124	STEP-FOCUS-OUT	Pulses stepper motor one step out (focus range: 6 ft. to $\infty$ in 50 steps).
1125	MULT-STEP-FOCUS-IN	Starts stepper motor to run focus in until command is repeated.
1126	MULT-STEP-FOCUS-OUT	Starts stepper motor to run focus out until command is repeated.
1127	STEP-FLTR-POSITION-RIGHT	Pulses stepper motor to rotate filter wheel 90 degrees to right (360° maximum rotation).

(This table continued on next page.)

TABLE IV-VIII (CONT'D)

DECODER TITLE: TELEVISION SURVEY CAMERA (NO. 3)

OCTAL COMMAND NUMBER	SHORT COMMAND TITLE	SPACECRAFT RESPONSE INITIATED
1130	STEP-FLTR-POSITION-LEFT	Pulses stepper motor to rotate filter wheel 90 degrees to left (360° maximum rotation).
1131	SPARE	
1132	SPARE	
1133	SURVEY-CAMERA-VTC-ON	Turns on power to Survey Camera vidicon heater.
1134	SURVEY-CAMERA-VTC-OFF	Turns off power to vidicon heater in Survey Camera.
1135	SPARE	
1136	SURVEY-CAMERA-ETC-ON	Turns on power to Camera No. 3 electronics heater.
1137	SURVEY-CAMERA-ETC-OFF	Turns off power to Survey Camera No. 3 electronics heater.

## SECTION V

## STANDARD SEQUENCE OF EVENTS

## A. GENERAL

Table V-I, the Standard Sequence of Events, specifies an expected sequence of events during normal operation of the Atlas/Centaur vehicle, the Surveyor spacecraft, and the Space Flight Operations System.

This sequence is based on an arbitrarily selected, but representative trajectory in which lunar landing occurs during the lunar day, with relatively low Sun angle. The nominal time of touchdown is 62 hours 42 minutes 57 seconds after launch.

This sequence incorporates the currently planned on-board automations of Sun acquisition, although the details of this operation are not yet available.

## B. LEGEND FOR TABLE V-I, STANDARD SEQUENCE OF EVENTS

<u>Time of Event Column</u>		<u>Station Column</u>	
T	- Countdown Time Before Liftoff	A	- Mission Control, SFOF
L	- Time of Liftoff	Comm	- Communications Center, SFOF
I	- Time of Injection	Data	- Data Processing System, SFOF
TD	- Time of Touchdown	Net	- DSIF Net Control, SFOF
R	- Time of Retro Engine Ignition	E	- JPL/HAC Control, AFETR
		FP	- Flight Path Analysis and Command (FPAC)
		S/C	- Spacecraft
		SF	- Space Flight Operations Facility (SFOF)
		SP	- Spacecraft Performance Analysis and Command (SPAC)
		SS	- Space Science Analysis and Command (SSAC)
		T/M	- Telemetry
		CCF	- Cape Computing Facility, AFETR

AFETR and DSIF Stations

AFETR 1. 16,	- Cape Kennedy
Tel II	
AFETR 12	- Ascension Island
AFETR 9. 1	- Antigua
DSIF 11	- Goldstone Pioneer Station, California
DSIF 42	- Canberra, Australia
DSIF 51	- Johannesburg, South Africa

TABLE V-I STANDARD SEQUENCE OF EVENTS

ITEM	TIME OF EVENT	STATION	EVENT
LL	T-10H	E	1. SPACECRAFT READINESS TESTS BEGIN.
KK	T-6H	DATA	1. START FINAL CHECKOUT OF DATA PROCESSING SYSTEM.
JJ	T-5H20M	COMM	1. ESTABLISH COMMUNICATIONS BETWEEN SF, DSIF, AND AFETR.
II	T-5H10M	E	1. REPORT TO A PLANNED GMT LAUNCH TIME AND START AND END OF LAUNCH WINDOW. 2. REPORT TO A STEA-S/C STATUS.
HH	T-5H6M	A	1. ANNOUNCE PLANNED GMT LAUNCH TIME AND WINDOW TO SF, AND DSIF 11, 42, 51.
GG	T-4H40M	E	1. REPORT TO A START OF ATLAS/CENTAUR COUNTDOWN.
FF	T-4H30M	E	1. REPORT TO A STATUS OF S/C COUNTDOWN.
EE	T-4H	E	1. REPORT TO A START OF RF SILENCE. 2. REPORT TO A START OF ATLAS PROPULSION IGNITER INSTALLATION AND CONNECTION. 3. REPORT TO A START OF NOSE FAIRING EXPLOSIVE BOLT INSTALLATION AND CONNECTION.
DD	T-3H40M	E	1. REPORT TO A STATUS OF S/C COUNTDOWN.
CC	T-3H30M	E	1. REPORT TO A START OF ATLAS AUTO-PILOT TESTS.
BB	T-3H10M	E	1. REPORT TO A COMPLETION OF ATLAS PROPULSION IGNITER INSTALLATION AND CONNECTION. 2. REPORT TO A COMPLETION OF NOSE FAIRING EXPLOSIVE BOLT INSTALLATION AND

## ITEM TIME OF EVENT STATION

## EVENT

B (CONTINUED)

CONNECTION.

AA T-2H40M

E

1. REPORT TO A START OF CENTAUR AUTO-PILOT TESTS.
2. REPORT TO A ACTIVATION OF ATLAS AND CENTAUR BATTERIES.
3. REPORT TO A STATUS OF S/C COUNT-DOWN.

Z T-2H

E

1. REPORT TO A PREPARATION FOR TOWER REMOVAL.
2. REPORT TO A END OF RF SILENCE.

Y T-1H20M

E

1. REPORT TO A START OF ESTABLISHMENT OF RF LINK WITH S/C.
2. REPORT TO A STATUS OF S/C COUNTDOWN.
3. REPORT TO A REMOVAL OF TOWER.

X T-1H13M

E

1. REPORT TO A COMPLETION OF ESTABLISHMENT OF RF LINK WITH S/C.

W T-1H12M

E

1. START TRANSMISSION OF S/C TELEMETRY TO SF.

V T-1H12M

DATA

1. START PROCESSING S/C DATA AND PROVIDE PROCESSED DATA TO SF.

U T-1H

E

1. REPORT TO A START OF CENTAUR LOX TANKING.
2. REPORT TO A REQUIRED S/C ELECTRONICS CONDITIONS FOR LAUNCH ESTABLISHED.

T T-40M

E

1. REPORT TO A COMPLETION OF CENTAUR LOX TANKING.
2. REPORT TO A START OF ATLAS LOX TANKING.
3. REPORT TO A STATUS OF S/C COUNTDOWN.

ITEM	TIME OF EVENT	STATION	EVENT
S	T-40M	SP	1. REPORT TO A GENERAL VERIFICATION OF S/C STATUS.
R	T-35M	E	1. SEND S/C TELECOMMUNICATIONS FREQUENCY AND TEMPERATURE MEASUREMENTS TO SP AND FP. 2. REPORT TO A ATLAS/CENTAUR BATTERIES CHECKED.
Q	T-30M	SP	1. REPORT S/C TRANSMITTER FREQUENCIES AND DRIFT RATES AND DSIF TRANSMITTER FREQUENCIES TO FP.
P	T-25M	E	1. REPORT TO A COMPLETION OF S/C SIGNAL PROCESSING CHECKOUT. 2. REPORT TO A START OF CENTAUR LIQUID HYDROGEN TANKING. 3. REPORT TO A START OF FINAL RANGE SAFETY CHECK.
O	T-20M	E	1. REPORT TO A START OF S/C FLIGHT CONTROL CHECKS.
N	T-17M	E	1. REPORT TO A COMPLETION OF FINAL RANGE SAFETY CHECK.
M	T-15M	E	1. REPORT TO A TURN-OFF OF S/C EXTERNAL POWER AND TURN-ON OF S/C INTERNAL POWER. 2. REPORT TO A START OF S/C POWER PARAMETERS MONITORING. 3. SEND S/C TELECOMMUNICATIONS FREQUENCY AND TEMPERATURE MEASUREMENTS TO SP AND FP.
L	T-12M	E	1. REPORT TO A COMPLETION OF S/C POWER PARAMETERS MONITORING. 2. REPORT TO A TURN-OFF OF S/C INTERNAL POWER AND TURN-ON OF S/C EXTERNAL

## ITEM TIME OF EVENT STATION

## EVENT

L (CONTINUED)

POWER.

K T-10M

SP

1. REPORT S/C TRANSMITTER FREQUENCIES AND DRIFT RATES AND DSIF TRANSMITTER FREQUENCIES TO FP.

J T-10M

FP

1. REPORT TO A TRANSMISSION OF FREQUENCY INFORMATION TO AFETR CCF.

I T-10M

E

1. REPORT TO A START OF CENTAUR LOX TOPPING.
2. REPORT TO A COMPLETION OF ATLAS/ CENTAUR AUTOPILOT TESTS.
3. REPORT TO A COMPLETION OF S/C FLIGHT CONTROL CHECKS.

H T-5M

E

1. REPORT TO A COMPLETION OF ATLAS LOX TANKING.
2. REPORT TO A START OF ATLAS LOX TOPPING.
3. REPORT TO A LAUNCH PLAN.
4. REPORT TO A COMPLETION OF CENTAUR LOX TOPPING.

G T-5M

FP

1. REPORT TO A START OF COMPUTATION OF INJECTION CONDITIONS BASED ON ESTIMATED LAUNCH TIME (IF REQUIRED) (94 X, Y).

F T-4M

FP

1. COMPLETE CALCULATION OF T-5 INJECTION CONDITIONS (IF REQUIRED).
2. BEGIN COMPUTATION OF DSIF 51 PREDICTS (IF REQUIRED) (94X,Y).

E T-3M

E

1. REPORT TO A TURN-OFF OF CENTAUR EXTERNAL POWER AND TURN-ON OF CENTAUR INTERNAL POWER.

D T-2M30S

E

1. REPORT TO A TURN-OFF OF ATLAS EX-

## ITEM TIME OF EVENT STATION

## EVENT

D (CONTINUED)

TERNAL POWER AND TURN-ON OF ATLAS  
INTERNAL POWER.

2. REPORT TO A TURN-OFF OF S/C EX-  
TERNAL POWER.
3. REPORT TO A COMPLETION OF ATLAS LOX  
TOPPING.
4. REPORT TO A COMPLETION OF CENTAUR  
LIQUID HYDROGEN TANKING.

C T-1M

E

1. REPORT TO A ATLAS AND CENTAUR ARMED.
2. REPORT TO A COMPLETION OF CENTAUR  
LIQUID HYDROGEN TOPPING.

B T-18S

E

1. REPORT TO A START OF ATLAS ENGINE.

A T-17S

E

1. REPORT TO A CENTAUR UPPER UMBILICAL  
REMOVED.

1 L=T-0

E

1. LIFTOFF. REPORT TO A LIFTOFF TIME.

2 T=0

CCF

1. START REAL TIME RANGE SAFETY  
IMPACT PREDICTION.

3 T=0

A

1. ANNOUNCE LIFTOFF TIME TO SF AND DSIF  
NETS.

4 L+30S

E

1. REPORT TO A ACQUISITION BY AFETR TEL  
II.
2. REPORT TO A RECEPTION OF S/C T/M  
(VHF) FROM AFETR TEL II.
3. BEGIN TRANSMISSION OF S/C T/M FROM  
AFETR TEL II TO SF.

5 L+2M

FP

1. COMPLETE COMPUTATION OF PREDICTS BASED  
ON ESTIMATED LAUNCH TIME (IF  
REQUIRED) (94 X, Y).
2. REPORT TO A START OF COMPUTATION OF  
INJECTION CONDITIONS BASED ON

## ITEM TIME OF EVENT STATION

## EVENT

5	(CONTINUED)		ANNOUNCED LAUNCH TIME (94 X, Y).
6	L+	E	1. REPORT TO A ATLAS BOOSTER ENGINE CUTOFF (BECO). MARK 1.
7	L+	E	1. REPORT TO A ATLAS BOOSTER ENGINE JETTISON. MARK 2.
8	L+	E	1. REPORT TO A CENTAUR INSULATION PANEL JETTISON. MARK 3.
9	L+3M	FP	1. TRANSMIT NOMINAL (T-5) PREDICTS TO DSIF 51 (IF REQUIRED).  2. COMPLETE COMPUTATION OF INJECTION CONDITIONS BASED ON ANNOUNCED LAUNCH TIME.  3. BEGIN COMPUTATION OF NOMINAL TRAJECTORY BASED ON ANNOUNCED LAUNCH TIME (94 X, Y).
10	L+	E	1. REPORT TO A S/C NOSE FAIRING JETTISON. MARK 4.
11	L+	E	1. REPORT TO A ATLAS SUSTAINER ENGINE CUTOFF (SECO). MARK 5.
12	L+	E	1. REPORT TO A ATLAS/CENTAUR SEPARATION. MARK 7.
13	L+	E	1. REPORT TO A CENTAUR MAIN ENGINE IGNITION (MEIG). MARK 8.
14	L+6M9S	E	1. REPORT TO A RECEPTION OF S/C T/M (VHF) FROM AFETR 9.1.  2. SWITCH TO AFETR 9.1 T/M FOR TRANSMISSION TO SF.
15	L+7M	E	1. REPORT TO A LOSS OF SIGNAL BY AFETR TEL II.
16	L+10M	E	1. REPORT TO A RECEPTION OF S/C T/M (VHF) FROM AFETR SHIP.

## ITEM TIME OF EVENT STATION

## EVENT

16 (CONTINUED)

2. SWITCH TO SHIP T/M FOR TRANSMISSION TO SF.

17 L+11M=I

E

1. REPORT TO A CENTAUR MAIN ENGINE CUTOFF (MECO). MARK 9=INJECTION. (TIME OF INJECTION IS VARIABLE. TIMES GIVEN FOR SUBSEQUENT MARK EVENTS ARE BASED ON INJECTION AT L+11M).

18 I+44S

E

1. REPORT TO A SURVEYOR LANDING GEAR EXTEND COMMAND SENT. MARK 13.

19 I+54S

E

1. REPORT TO A SURVEYOR OMNIANTENNAS EXTEND COMMAND SENT. MARK 14.

20 I+1M

E

1. REPORT TO A LOSS OF SIGNAL BY AFETR 9.1.

21 I+1M

CCF

1. BEGIN TRANSMISSION OF RAW AFETR TRACKING DATA TO SF.

22 I+1M14S

E

1. REPORT TO A SURVEYOR HIGH-POWER TRANSMITTER ON. MARK 15.

2. AFETR STATIONS SWITCH TO S/C S-BAND T/M FOR TRANSMISSION TO E.

3. REPORT TO A S-BAND SIGNAL ACQUISITION BY SHIP.

23 I+1M20S

E

1. REPORT TO A CENTAUR/SURVEYOR ELECTRICAL DISCONNECT. MARK 16.

24 I+1M25S

E

1. REPORT TO A CENTAUR/SURVEYOR SEPARATION. MARK 17.

25 I+1M25S

SP

1. REPORT TO A START OF SOLAR PANEL DEPLOYMENT AND START OF AUTOMATIC SUN ACQUISITION TIMER.

26 I+2M

FP

1. REPORT TO A COMPLETION OF NOMINAL TRAJECTORY COMPUTATION.

27 I+2M

CCF

1. REPORT TO A START OF COMPUTATION OF

## ITEM TIME OF EVENT STATION

## EVENT

27 (CONTINUED)

INJECTION CONDITIONS.

28 I+5M28S

E

1. REPORT TO A CENTAUR AND S/C ON AFETR 12 HORIZON.

29 I+6M

SP

1. REPORT TO DSIF 51 LANDING GEAR, OMNIS, HIGH-POWER, SEPARATION STATUS.

30 I+6M

CCF

1. REPORT TO A COMPLETION OF INJECTION CONDITIONS AND ORBITAL ELEMENTS COMPUTATION.
2. REPORT TO A START OF COMPUTATION OF PREDICTS FOR DSIF 51.
3. TRANSMIT INJECTION CONDITIONS AND ORBITAL ELEMENTS TO SF.

31 I+7M

CCF

1. BEGIN TRANSMITTING PREDICTS FOR DSIF 51 TO SF.

32 I+7M

COMM

1. BEGIN RETRANSMITTING CCF PREDICTS TO DSIF 51.

33 I+8M

E

1. REPORT TO A CENTAUR C-BAND ACQUISITION BY AFETR 12.
2. REPORT TO A S/C S-BAND ACQUISITION BY AFETR 12.
3. SWITCH TO AFETR 12 S/C T/M FOR TRANSMISSION TO SF.

34 I+9M

CCF

1. START TRANSMITTING RAW TRACKING DATA FROM AFETR 12 TO SF.

35 I+10M

FP

1. REPORT TO A DECISION ON USE OF AFETR PREDICTS AT DSIF 51.

36 I+10M30S

A

1. DIRECT DSIF 51 TO USE APPROPRIATE PREDICTS.

37 I+11M30S

SP

1. REPORT TO A SOLAR PANEL ERECTED.

38 I+12M12S

51

1. VISIBILITY BEGINS.

ITEM	TIME OF EVENT	STATION	EVENT
39	I+12M12S	NET	1. REPORT TO A START OF SEARCH FOR S/C BY DSIF 51.
40	I+13M30S	NET	1. REPORT TO A DETECTION OF S/C BY DSIF 51.
41	I+15M	NET	1. REPORT TO A DSIF 51 IN ONE-WAY LOCK WITH S/C.
42	I+15M	FP	1. REPORT TO A START OF FIRST ORBIT DETERMINATION (94 X, Y).
43	I+17M	CCF	1. REPORT TO A COMPLETION OF TRANSMISSION TO SF OF PREDICTS FOR DSIF 51.
44	I+17M30S	E	1. REPORT TO A CENTAUR RETRO START. MARK 18.
45	I+19M	NET	1. REPORT TO A DSIF 51 IN TWO-WAY LOCK WITH S/C.
46	I+19M	51	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
47	I+19M	CCF	1. COMPLETE TRANSMISSION OF RAW AFETR TRACKING DATA TO SF. 2. REPORT TO A START OF MULTIPLE STATION ORBIT COMPUTATION.
48	I+19M30S	SP	1. CONFIRM TO A LANDING GEAR AND OMNI-ANTENNA EXTENSION AND SOLAR PANEL ERECTION.
49	I+20M30S	SP	1. CONFIRM TO A AUTOMATIC SUN ACQUISITION (MAXIMUM TIME). 2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0040 (INITIAL S/C OPERATIONS).
50	I+21M	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0040.

ITEM	TIME OF EVENT	STATION	EVENT
51		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCE 0040.
52	I+21M25S	51	1. EXECUTE MINOR SEQUENCE *0051* (COAST TO COMMUTATOR 1).
53	I+21M30S	51	1. EXECUTE MINOR SEQUENCE *0050* (ACCELEROMETER AMPLIFIERS OFF).
54	I+22M5S	51	1. EXECUTE MINOR SEQUENCE *0057* (SOLAR PANEL DEPLOY LOGIC OFF).
55	I+24M25S	51	1. EXECUTE MINOR SEQUENCE *0052* (INITIAL 4400 BPS SELECTION).
56	I+25M30S	51	1. EXECUTE MINOR SEQUENCE *0054* (CRUISE MODE).
57	I+26M	51	1. EXECUTE MINOR SEQUENCE *0055* (COMMUTATOR 4 SELECTION).
58	I+28M30S	51	1. EXECUTE MINOR SEQUENCE *0251* (COMMUTATOR 2 SELECTION).
59	I+30M	FP	1. BRIEF A ON STATUS OF AFETR AND DSIF TRACKING DATA.
60	I+31M	51	1. EXECUTE MINOR SEQUENCE *0056* (COMMUTATOR 3 SELECTION).
61	I+33M30S	51	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).
62	I+34M	CCF	1. REPORT TO A COMPLETION OF MULTIPLE STATION ORBIT COMPUTATION. 2. TRANSMIT INJECTION CONDITIONS TO SF.
63	I+35M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0040 AND STATUS OF S/C RESPONSE. 2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0044 (TRANSMITTER B HIGH POWER OFF).

## ITEM TIME OF EVENT STATION

## EVENT

ITEM	TIME OF EVENT	STATION	EVENT
64	I+35M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0044.
65	I+36M	51	1. EXECUTE MINOR SEQUENCE *0552* (TRANSMITTER B HIGH POWER OFF).
66	I+36M30S	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0044 AND STATUS OF S/C RESPONSE.
67	I+37M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 1044 (TRANSPONDER A ON).
68	I+37M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 1044.
69		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCE 1044.
70	I+38M	51	1. EXECUTE MINOR SEQUENCE *1054* (TRANSPONDER A ON).
71	I+40M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 1044 AND STATUS OF S/C RESPONSE. 2. REPORT TO A START OF POWER THERMAL PROGRAM UPDATE.
72	I+1H10M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0140 (4400 TO 1100 BPS) (IF REQUIRED).
73	I+1H10M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0140.
74		SP	1. CONTROL DSIF EXECUTION OF MAJOR SEQUENCE 0140.
75	I+1H11M	51	1. EXECUTE MINOR SEQUENCE *0150* (4400 TO 1100 BPS).
76	I+1H12M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0140 AND STATUS OF S/C

ITEM	TIME OF EVENT	STATION	EVENT
76	(CONTINUED)		RESPONSE.
77	I+1H20M	FP	1. REPORT TO A COMPLETION OF FIRST ORBIT DETERMINATION. 2. BEGIN TRAJECTORY COMPUTATION (94 X).
78	I+1H35M	FP	1. TRANSMIT REVISED PREDICTS TO DSIF 51.
79	I+1H40M	FP	1. COMPLETE TRAJECTORY COMPUTATION.
80	I+1H40M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
81	I+1H50M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0141 (1100/4400 TO 550 BPS) ( IF REQUIRED).
82	I+1H50M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0141.
83		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCE 0141.
84	I+1H51M	51	1. EXECUTE MINOR SEQUENCE *0151* (1100/4400 TO 550 BPS).
85	I+1H52M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0141 AND STATUS OF S/C RESPONSE.
86	I+2H	FP	1. REPORT TO A START OF SECOND ORBIT DETERMINATION (INITIAL CONDITION EVALUATION) (94 X, Y).
87	I+2H30M	FP	1. REPORT TO A COMPLETION OF SECOND ORBIT DETERMINATION. 2. BEGIN TRAJECTORY COMPUTATION (94 X).
88	I+2H40M	FP	1. COMPLETE TRAJECTORY COMPUTATION.

## ITEM TIME OF EVENT STATION

## EVENT

88	(CONTINUED)		2. GENERATE TELECOMMUNICATIONS SAVE TAPE FOR SP.
89	I+2H40M	SP	1. REPORT TO A START OF POWER, THER- MAL PROGRAM UPDATE, AND TELECOMMUNICATIONS PROGRAM RUN.
90	I+3H	FP	1. REPORT TO A START OF THIRD ORBIT DETERMINATION (PRELIMINARY MID- COURSE ORBIT) (94X, Y).
91	I+3H15M	SP	1. BRIEF A ON RESULTS OF TELECOMMU- NICATIONS PROGRAM RUN.
92	I+3H40M	SP	1. REPORT TO A START OF POWER, THER- MAL PROGRAM UPDATE.
93	I+4H	FP	1. REPORT TO A COMPLETION OF THIRD ORBIT DETERMINATION.  2. BEGIN TRAJECTORY COMPUTATION (94X).
94	I+4H5M	FP	1. TRANSMIT PREDICTS TO DSIF 51, 11, 42.
95	I+4H10M	FP	1. COMPLETE TRAJECTORY COMPUTATION.  2. REPORT TO A START OF PRELIMINARY MIDCOURSE COMPUTATION (94X, Y).
96	I+4H40M	SP	1. REPORT TO A START OF POWER, THER- MAL PROGRAM UPDATE.
97	I+4H55M	FP	1. REPORT TO A COMPLETION OF PRE- LIMINARY MIDCOURSE COMPUTATION.
98	I+4H55M	SP	1. REPORT TO A START OF POWER, THERMAL PREDICTION COMPUTATION.
99	I+5H10M	FP	1. GIVE PRELIMINARY M/C CORRECTION DATA TO SP.  2. BRIEF SS, A ON RESULTS OF PRELIMINARY M/C STUDY.

ITEM	TIME OF EVENT	STATION	EVENT
100	I+5H10M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0144 (550 TO 137.5 BPS) (IF REQUIRED).
101	I+5H10M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0144.
102		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCE 0144.
103	I+5H11M	51	1. EXECUTE MINOR SEQUENCE *0154* (550 TO 137.5 BPS).
104	I+5H12M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0144 AND STATUS OF S/C RESPONSE.
105	I+5H20M	FP	1. REPORT TO A START OF FOURTH ORBIT DETERMINATION (DATA CONSISTENCY ORBIT) (94X, Y).
106	I+5H30M	SP	1. REPORT TO A RESULTS OF POWER THERMAL PREDICTION COMPUTATIONS.
107	I+5H40M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
108	I+5H45M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0245 (HIGH POWER INTERROGATION) (B, 17.2/137.5 TO 4400).
109	I+5H45M30S	A	1. DIRECT SP TO CONTROL MAJOR SEQUENCE 0245.
110		SP	1. CONTROL DSIF EXECUTION OF MAJOR SEQUENCE 0245.
111	I+5H46M	51	1. EXECUTE MINOR SEQUENCE *0652* (TRANSMITTER B FILAMENT ON).
112	I+5H46M25S	51	1. EXECUTE MINOR SEQUENCE *0250* (COAST TO COMMUTATOR 4).
113	I+5H47M30S	51	1. EXECUTE MINOR SEQUENCE *0653*

ITEM	TIME OF EVENT	STATION	EVENT
113	(CONTINUED)		(TRANSMITTER B HIGH POWER ON).
114	I+5H47M50S	51	1. EXECUTE MINOR SEQUENCE *0254* (17.2/137.5 TO 4400 BPS).
115	I+5H50M50S	51	1. EXECUTE MINOR SEQUENCE *0251* (COMMUTATOR 2 SELECTION).
116	I+5H53M20S	51	1. EXECUTE MINOR SEQUENCE *0252* (COMMUTATOR 1 SELECTION).
117	I+5H56M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0245 AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0642 (STAR VERI- FICATION/ACQUISITION).
118	I+5H56M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0642.
119		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCE 0642.
120	I+5H57M	51	1. EXECUTE MINOR SEQUENCE *1050* (TRANSPONDER OFF).
121	I+5H58M20S	SP	1. REPORT TO A DSIF REACQUISITION.
122	I+5H58M20S	51	1. EXECUTE MINOR SEQUENCE *0654* (FLIGHT CONTROL PREPARATIONS).
123	I+5H59M	51	1. EXECUTE MINOR SEQUENCE *1251* (SUN AND ROLL) (720 DEG. ROLL).
124	I+6H11M	51	1. EXECUTE MINOR SEQUENCE *1051* (SELECT OMNIANTENNA A).
125	I+6H23M	51	1. EXECUTE MINOR SEQUENCE *0655* (SUN AND STAR MODE).
126	I+6H23M20S	51	1. EXECUTE MINOR SEQUENCE *1052* (SELECT OMNIANTENNA B).

ITEM	TIME OF EVENT	STATION	EVENT
127	I+6H35M	51	1. EXECUTE MINOR SEQUENCE *0054* (CRUISE MODE).
128	I+6H35M	SP	1. REPORT TO A CANOPUS ACQUIRED.
129	I+6H36M	51	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).
130	I+6H37M	51	1. EXECUTE MINOR SEQUENCE *1053* (TRANSPONDER B ON).
131	I+6H39M	51	1. EXECUTE MINOR SEQUENCE *1054* (TRANSPONDER A ON).
132	I+6H40M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
133	I+6H41M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0642 AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCES 0142 (4400/1100 TO 137.5 BPS) AND 0044 (TRANSMITTER B HIGH POWER OFF).
134	I+6H41M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0142.
135		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCES 0142 AND 0044.
136	I+6H42M	51	1. EXECUTE MINOR SEQUENCE *0152* (1100/4400 TO 137.5 BPS).
137	I+6H43M	51	1. EXECUTE MINOR SEQUENCE *0552* (TRANSMITTER B HIGH POWER OFF).
138	I+6H44M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCES 0142 AND 0044 AND STATUS OF S/C RESPONSE.
139	I+7H	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0342 (START GYRO DRIFT CHECK).

ITEM	TIME OF EVENT	STATION	EVENT
140	I+7H30S	A	1. DIRECT SP TO CONTROL MAJOR SE- QUENCE 0342.
141		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCE 0342.
142	I+7H1M	51	1. EXECUTE MINOR SEQUENCE *0354* (INERTIAL MODE).
143	I+7H2M	SP	1. REPORT TO A COMPLETION OF EXECUTION OF MAJOR SEQUENCE 0342 (NOTE - GYRO DRIFT CHECK IS COMPLETED AT I+10H).
144	I+7H40M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
145	I+8H20M	FP	1. REPORT TO A COMPLETION OF FOURTH ORBIT DETERMINATION.  2. REPORT TO A START OF INTERMEDIATE M/C COMPUTATION (94X, Y).
146	I+8H30M	FP	1. BRIEF A ON RESULTS OF FOURTH ORBIT.
147	I+8H40M	SP	1. REPORT TO A START OF POWER, THER- MAL PROGRAM UPDATE.
148	I+9H5M	FP	1. REPORT TO A COMPLETION OF INTER- MEDIATE M/C COMPUTATIONS.
149	I+9H20M	FP	1. GIVE INTERMEDIATE M/C CORRECTION DATA TO SP.  2. BRIEF A ON RESULTS OF INTERMEDIATE M/C STUDY.  3. BEGIN TRAJECTORY COMPUTATION (94X).
150	I+9H30M	FP	1. COMPLETE TRAJECTORY COMPUTATION.
151	I+9H40M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.

ITEM	TIME OF EVENT	STATION	EVENT
152	I+10H	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0343 (TERMINATE GYRO DRIFT CHECK).
153	I+10H0M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0343.
154		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCE 0343.
155	I+10H1M	51	1. EXECUTE MINOR SEQUENCE *0357* (SUN ACQUISITION MODE).
156	I+10H3M	51	1. EXECUTE MINOR SEQUENCE *0655* (SUN AND STAR MODE).
157	I+10H5M	51	1. EXECUTE MINOR SEQUENCE *0054* (CRUISE MODE ON).
158	I+10H6M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0343 AND STATUS OF S/C RESPONSE.
159	I+10H25M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0046 (TRANSMITTER B HIGH POWER ON).
160	I+10H25M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0046.
161		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCE 0046.
162	I+10H26M	51	1. EXECUTE MINOR SEQUENCE *0652* (TRANSMITTER B FILAMENT ON).
163	I+10H27M30S	51	1. EXECUTE MINOR SEQUENCE *0653* (TRANSMITTER B HIGH POWER ON).
164	I+10H28M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0046.
165	I+10H39M	51	1. VISIBILITY ENDS.
166	I+10H40M	SP	1. REPORT TO A START OF POWER,

ITEM	TIME OF EVENT	STATION	EVENT
166	(CONTINUED)		THERMAL PROGRAM UPDATE.
167	I+10H42M	11	1. VISIBILITY BEGINS.
168	I+10H42M	NET	1. REPORT TO A START OF SEARCH FOR S/C BY DSIF 11.
169	I+10H44M	NET	1. REPORT TO A DETECTION OF S/C BY DSIF 11.
170	I+10H46M	NET	1. REPORT TO A DSIF 11 IN ONE-WAY LOCK WITH S/C.
171	I+10H52M	NET	1. REPORT TO A DSIF 11 IN TWO-WAY LOCK WITH S/C.
172	I+10H52M	11	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
173	I+10H55M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0044 (TRANSMITTER B HIGH POWER OFF).
174	I+10H55M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0044.
175		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0044.
176	I+10H56M	11	1. EXECUTE MINOR SEQUENCE *0552* (TRANSMITTER B HIGH POWER OFF).
177	I+10H56M30S	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0044.
178	I+11H	FP	1. REPORT TO A START OF FIFTH ORBIT DETERMINATION (94X, Y).
179	I+12H29M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0245 (HIGH-POWER ENGINEERING INTERROGATION (B, 17.2/137.5 TO 4400 BPS)).
180	I+12H29M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF COMMAND SEQUENCE 0245.

ITEM	TIME OF EVENT	STATION	EVENT
181		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0245.
182	I+12H30M	11	1. EXECUTE MINOR SEQUENCE <del>*0652*</del> (TRANSMITTER B FILAMENT ON).
183	I+12H30M	FP	1. REPORT TO A COMPLETION OF 5TH ORBIT DETERMINATION.  2. REPORT TO A START OF FINAL M/C MANEUVER COMPUTATION (94X,Y)
184	I+12H30M25S	11	1. EXECUTE MINOR SEQUENCE *0250* (COAST TO COMMUTATOR 4).
185	I+12H31M30S	11	1. EXECUTE MINOR SEQUENCE *0653* (TRANSMITTER B HIGH POWER ON).
186	I+12H31M50S	11	1. EXECUTE MINOR SEQUENCE *0254* (137.5/17.2 TO 4400 BPS).
187	I+12H34M50S	11	1. EXECUTE MINOR SEQUENCE *0251* (COMMUTATOR 2 SELECTION).
188	I+12H37M20S	11	1. EXECUTE MINOR SEQUENCE *0252* (COMMUTATOR 1 SELECTION).
189	I+12H40M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0245, AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0546 (COAST PHASE PREPARATION) (B, 137.5 BPS).
190	I+12H40M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0546.
191		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0546.
192	I+12H41M	11	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).
193	I+12H42M	11	1. EXECUTE MINOR SEQUENCE *0152*

ITEM	TIME OF EVENT	STATION	EVENT
193	(CONTINUED)		(1100/4400 TO 137.5 BPS).
194	I+12H43M	11	1. EXECUTE MINOR SEQUENCE *0552* . (TRANSMITTER B HIGH POWER OFF).
195	I+12H44M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0546.
196	I+12H50M	FP	1. REPORT TO A COMPLETION OF FINAL MIDCOURSE MANEUVER COMPUTATION.  2. BEGIN TRAJECTORY COMPUTATION BASED ON NOMINAL MIDCOURSE MANEUVER (94X).
197	I+13H	FP	1. COMPLETE TRAJECTORY COMPUTATION BASED ON NOMINAL MIDCOURSE MANEUVER.
198	I+13H	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
199	I+13H10M	FP	1. MIDCOURSE MANEUVER COMMAND DECISION 1.
200	I+13H25M	SP	1. MIDCOURSE MANEUVER COMMAND DECISION II.
201	I+13H29M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0245 (HIGH POWER INTERROGATION B, 17.2/137.5 TO 4400 BPS).
202	I+13H29M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0245.
203		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0245.
204	I+13H30M	11	1. EXECUTE MINOR SEQUENCE *0652* (TRANSMITTER B FILAMENT ON).
205	I+13H30M25S	11	1. EXECUTE MINOR SEQUENCE *0250* (COAST TO COMMUTATOR 4).

ITEM	TIME OF EVENT	STATION	EVENT
206	I+13H31M30S	11	1. EXECUTE MINOR SEQUENCE *0653* (TRANSMITTER B HIGH POWER ON).
207	I+13H31M50S	11	1. EXECUTE MINOR SEQUENCE *0254* (17.2/137.5 TO 4400 BPS).
208	I+13H34M50S	11	1. EXECUTE MINOR SEQUENCE *0251* (COMMUTATOR 2 SELECTION).
209	I+13H35M	SP	1. REPORT TO A COMPLETION OF M/C MANEUVER COMMAND MESSAGE PREPARATION.
210	I+13H35M	SP,FP	1. VALIDATE M/C MANEUVER COMMAND MESSAGE.
211	I+13H37M20S	11	1. EXECUTE MINOR SEQUENCE *0252* (COMMUTATOR 1 SELECTION).
212	I+13H40M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0245, AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0340 (GYRO SPEED CHECK 4400 BPS RETURN).  3. SEND TO A MIDCOURSE MANEUVER COMMAND REQUEST.
213	I+13H40M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0340.
214		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0340.
215	I+13H41M	11	1. EXECUTE MINOR SEQUENCE *0350* (HIGH BIT RATE SCO OFF/GYRO PROCESSING ON).
216	I+13H42M	A	1. COMMAND DIRECTIVE - SEND MIDCOURSE MANEUVER COMMAND MESSAGE TO DSIF 11.
217	I+13H42M30S	11	1. EXECUTE MINOR SEQUENCE *0351* (NEXT GYRO).

ITEM	TIME OF EVENT	STATION	EVENT
218	I+13H43M30S	11	1. CONTINUE MINOR SEQUENCE *0351* (NEXT GYRO).
219	I+13H44M30S	11	1. CONTINUE MINOR SEQUENCE *0351* (NEXT GYRO).
220	I+13H45M	11	1. PLAY BACK MIDCOURSE MANEUVER COMMAND TAPE FOR VERIFICATION.
221	I+13H45M30S	11	1. EXECUTE MINOR SEQUENCE *0352* (GYRO PROCESSING OFF/33KC SCO ON).
222	I+13H46M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0340, AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0546 (COAST PHASE PREPARATION (B, 137.5 BPS)).
223	I+13H46M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0546.
224		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0546.
225	I+13H47M	11	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).
226	I+13H48M	11	1. EXECUTE MINOR SEQUENCE *0152* (1100/4400 TO 137.5 BPS).
227	I+13H49M	11	1. EXECUTE MINOR SEQUENCE *0552* (TRANSMITTER B HIGH POWER OFF).
228	I+13H50M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0546, AND STATUS OF S/C RESPONSE.
229	I+14H	SP	1. REPORT TO A AND 11 COMPLETION OF M/C MANEUVER COMMAND TAPE VERIFICATION.
230	I+14H	FP	1. REPORT TO A START OF MIDCOURSE

ITEM	TIME OF EVENT	STATION	EVENT
230	(CONTINUED)		PREDICTION ORBIT DETERMINATION (94X).
231	I+14H17M	42	1. VISIBILITY BEGINS.
232	I+14H17M	NET	1. REPORT TO A START OF SEARCH FOR S/C BY DSIF 42.
233	I+14H18M	NET	1. REPORT TO A DETECTION OF S/C BY DSIF 42.
234	I+14H20M	NET	1. REPORT TO A DSIF 42 IN ONE-WAY LOCK WITH S/C.
235	I+14H25M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0245 (HIGH-POWER INTERROGATION (B, 17.2/137.5 TO 4400 BPS)).
236	I+14H25M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0245.
237		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0245.
238	I+14H26M	11	1. EXECUTE MINOR SEQUENCE *0652* (TRANSMITTER B FILAMENT ON).
239	I+14H26M25S	11	1. EXECUTE MINOR SEQUENCE *0250* (COAST TO COMMUTATOR 4).
240	I+14H27M30S	11	1. EXECUTE MINOR SEQUENCE *0653* (TRANSMITTER B HIGH POWER ON).
241	I+14H27M50S	11	1. EXECUTE MINOR SEQUENCE *0254* (17.2/137.5 TO 4400 BPS).
242	I+14H30M	FP	1. REPORT TO A COMPLETION OF MID-COURSE PREDICTION ORBIT DETERMINATION.
243	I+14H30M	SP	1. REPORT TO A START OF POWER THERMAL PROGRAM UPDATE.
244	I+14H30M50S	11	1. EXECUTE MINOR SEQUENCE *0251*

ITEM	TIME OF EVENT	STATION	EVENT
244	(CONTINUED)		(COMMUTATOR 2 SELECTION).
245	I+14H33M20S	11	1. EXECUTE MINOR SEQUENCE *0252* (COMMUTATOR 1 SELECTION).
246	I+14H36M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0245, AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0340 (GYRO SPEED CHECK (4400 BPS RETURN)).
247	I+14H36M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0340.
248		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0340.
249	I+14H37M	11	1. EXECUTE MINOR SEQUENCE *0350* (HIGH BIT RATE SCO OFF/GYRO PROCESSING ON).
250	I+14H38M30S	11	1. EXECUTE MINOR SEQUENCE *0351* (NEXT GYRO).
251	I+14H39M30S	11	1. CONTINUE MINOR SEQUENCE *0351* (NEXT GYRO).
252	I+14H40M	FP	1. TRANSMIT PREDICTS BASED ON NOMINAL MIDCOURSE MANEUVER TO DSIF 51,42,11.
253	I+14H40M30S	11	1. CONTINUE MINOR SEQUENCE *0351* (NEXT GYRO).
254	I+14H41M30S	11	1. EXECUTE MINOR SEQUENCE *0352* (GYRO PROCESSING OFF/33KC SCO ON).
255	I+14H42M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0340, AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE

ITEM	TIME OF EVENT	STATION	EVENT
255	(CONTINUED)		MAJOR SEQUENCES 0740, 1140, 1141, 0741.
256	I+14H42M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCES 0740, 1140, 1141, 0741.
257		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0740 (VERNIER PRESSURIZATION).
258	I+14H43M	11	1. EXECUTE MINOR SEQUENCE *0750* (VERNIER PRESSURIZATION).
259		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 1140 (PREMIDCOURSE SUN AND ROLL).
260	I+14H44M	11	1. EXECUTE MINOR SEQUENCE *1150* (SUN AND ROLL PARAMETERS).
261	I+14H45M	11	1. EXECUTE MINOR SEQUENCE *1251* (SUN AND ROLL).
262		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 1141 (PREMIDCOURSE YAW).
263	I+14H48M	11	1. EXECUTE MINOR SEQUENCE *1151* (YAW PARAMETERS).
264	I+14H49M	11	1. EXECUTE MINOR SEQUENCE *1253* (YAW).
265		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0741 (MIDCOURSE THRUST PREPARATION).
266	I+14H56M	11	1. EXECUTE MINOR SEQUENCE *0751* (PROPULSION STRAIN GAUGE POWER/ PROGRAMMER LATCH RESET).
267	I+14H57M	11	1. EXECUTE MINOR SEQUENCE *0752* (THRUST PHASE POWER).
268	I+14H58M	11	1. EXECUTE MINOR SEQUENCE *0753* (MIDCOURSE THRUST QUANTITY).

ITEM	TIME OF EVENT	STATION	EVENT
269	I+14H59M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0740, 1140, 1141, 0741 AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0742 (MIDCOURSE THRUST EXECUTION).
270	I+14H59M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0742.
271		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0742.
272	I+15H	11	1. EXECUTE MINOR SEQUENCE *0754* (MIDCOURSE THRUST EXECUTION).
273	I+15H	FP	1. COMPARE PREDICTED AND OBSERVED DOPPLER SHIFTS IN REAL TIME DURING MIDCOURSE EXECUTION.
274	I+15H1M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0742 AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCES 0743, 1240, 1243, 1244, 1245, AND 0547.
275	I+15H1M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCES 0743, 1240, 1243, 1244, 1245, 0547.
276		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0743 (FLIGHT CONTROL THRUST/STRAIN GAUGE POWER OFF).
277	I+15H2M	11	1. EXECUTE MINOR SEQUENCE *0755* (FLIGHT CONTROL THRUST/STRAIN GAUGE POWER OFF).
278		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 1240 (POSTMIDCOURSE YAW).
279	I+15H2M30S	11	1. EXECUTE MINOR SEQUENCE *1252*

ITEM	TIME OF EVENT	STATION	EVENT
279	(CONTINUED)		(YAW PARAMETERS).
280	I+15H3M30S	11	1. EXECUTE MINOR SEQUENCE *1253* (YAW).
281		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 1243 (SUN ACQUISITION).
282	I+15H11M	11	1. EXECUTE MINOR SEQUENCE *0357* (SUN ACQUISITION MODE ON).
283		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 1244 (POSTMIDCOURSE SUN AND ROLL).
284	I+15H12M30S	11	1. EXECUTE MINOR SEQUENCE *1250* (SUN AND ROLL PARAMETERS).
285	I+15H13M30S	11	1. EXECUTE MINOR SEQUENCE *1251* (SUN AND ROLL).
286		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 1245 (SUN AND STAR ACQUISITION INTERROGATION).
287	I+15H16M30S	11	1. EXECUTE MINOR SEQUENCE *0655* (SUN AND STAR ACQUISITION MODE).
288	I+15H17M	11	1. EXECUTE MINOR SEQUENCE *0054* (CRUISE MODE).
289	I+15H17M30S	11	1. EXECUTE MINOR SEQUENCE *0251* (COMMUTATOR 2 SELECTION).
290	I+15H20M	11	1. EXECUTE MINOR SEQUENCE *0055* (COMMUTATOR 4 SELECTION).
291		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0547.
292	I+15H22M30S	11	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).
293	I+15H23M30S	11	1. EXECUTE MINOR SEQUENCE *0153*

ITEM	TIME OF EVENT	STATION	EVENT
293	(CONTINUED)		(1100/4400 TO 17.2 BPS).
294	I+15H24M30S	11	1. EXECUTE MINOR SEQUENCE *0552* (TRANSMITTER B HIGH POWER OFF).
295	I+15H25M30S	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCES 0743, 1240, 1243, 1244, 1245, 0547 AND STATUS OF S/C RESPONSE.
296	I+15H30M	FP	1. BRIEF SFOD ON INITIAL EVALUATION OF MIDCOURSE MANEUVER.
297	I+15H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
298	I+16H	NET	1. REPORT TO A START OF STATION TRANSFER PROCEDURE.
299	I+16H5M	NET	1. REPORT TO A DSIF 11 TRANSMITTER OFF AND ONE-WAY LOCK WITH S/C.
300	I+16H6M	NET	1. REPORT TO A DSIF 42 IN TWO-WAY LOCK WITH S/C.
301	I+16H6M	42	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
302	I+16H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
303	I+17H	NET	1. REPORT TO A START OF STATION TRANSFER PROCEDURE.
304	I+17H5M	NET	1. REPORT TO A DSIF 42 TRANSMITTER OFF AND ONE-WAY LOCK WITH S/C.
305	I+17H6M	NET	1. REPORT TO A DSIF 11 IN TWO-WAY LOCK WITH S/C.
306	I+17H6M	11	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
307	I+17H30M	SP	1. REPORT TO A START OF POWER THERMAL PROGRAM UPDATE, AND POWER THERMAL PREDICTION

ITEM	TIME OF EVENT	STATION	EVENT
307	(CONTINUED)		COMPUTATION.
308	I+18H25M	NET	1. REPORT TO A START OF STATION TRANSFER PROCEDURE.
309	I+18H30M	NET	1. REPORT TO A DSIF 11 TRANSMITTER OFF AND S/C TRACKING STOPPED.
310	I+18H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
311	I+18H31M	NET	1. REPORT A DSIF 42 IN TWO-WAY LOCK WITH S/C.
312	I+18H31M	42	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
313	I+18H49M	11	1. VISIBILITY ENDS.
314	I+19H	SP	1. BRIEF A ON RESULTS OF POWER, THERMAL PREDICTION COMPUTATION.
<p>*****NOTE***** THE FOLLOWING SET OF COMMAND SEQUENCES (0641, 0642, 0547) WILL BE EXECUTED ONLY IF NECESSARY TO VERIFY STAR LOCK-ON.</p>			
315	I+19H5M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0641 (TRANSMITTER B SETUP FOR STAR VERIFICATION).
316	I+19H5M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0641.
317		SP	1. CONTROL DSIF 42 EXECUTION OF MAJOR SEQUENCE 0641.
318	I+19H6M	42	1. EXECUTE MINOR SEQUENCE *0652* (TRANSMITTER B FILAMENT).
319	I+19H6M25S	42	1. EXECUTE MINOR SEQUENCE *0051* (COAST TO COMMUTATOR 1).
320	I+19H7M30S	42	1. EXECUTE MINOR SEQUENCE *0653* (TRANSMITTER B HIGH POWER ON).

ITEM	TIME OF EVENT	STATION	EVENT
321	I+19H7M50S	42	1. EXECUTE MINOR SEQUENCE *0254* (17.2/137.5 TO 4400 BPS).
322	I+19H9M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0641 AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0642 (STAR VERIFICATION AC- QUISITION OMNIANTENNA B).
323		SP	1. CONTROL DSIF 42 EXECUTION OF MAJOR SEQUENCE 0642.
324	I+19H10M	42	1. EXECUTE MINOR SEQUENCE *1050* (TRANSPONDERS OFF).
325	I+19H11M20S	SP	1. REPORT TO A DSIF REACQUISITION.
326	I+19H11M20S	42	1. EXECUTE MINOR SEQUENCE *0654* (FLIGHT CONTROL PREPARATION).
327	I+19H12M	42	1. EXECUTE MINOR SEQUENCE *1251* (SUN AND ROLL) (720 DEG. ROLL).
328	I+19H24M	42	1. EXECUTE MINOR SEQUENCE *1051* (SELECT OMNIANTENNA A).
329	I+19H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
330	I+19H36M	42	1. EXECUTE MINOR SEQUENCE *0655* (SUN AND STAR MODE).
331	I+19H36M20S	42	1. EXECUTE MINOR SEQUENCE *1052* (SELECT OMNIANTENNA B).
332	I+19H48M	42	1. EXECUTE MINOR SEQUENCE *0054* (CRUISE MODE).
333	I+19H48M	SP	1. REPORT TO A CANOPUS ACQUIRED.
334	I+19H49M	42	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).

ITEM	TIME OF EVENT	STATION	EVENT
335	I+19H50M	42	1. EXECUTE MINOR SEQUENCE *1053* (TRANSPONDER B ON).
336	I+19H52M	42	1. EXECUTE MINOR SEQUENCE *1054* (TRANSPONDER A ON).
337	I+19H54M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0642 AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCES 0143 (4400/1100 TO 17.2 BPS) AND 0044 (TRANSMITTER B HIGH POWER OFF).
338	I+19H54M30S	A	1. DIRECT SP TO CONTROL EXECUTION MAJOR SEQUENCE 0143 AND 0044.
339		SP	1. CONTROL DSIF 42 EXECUTION OF MAJOR SEQUENCES 0143 AND 0044.
340	I+19H55M	42	1. EXECUTE MINOR SEQUENCE *0153* (1100/4400 TO 17.2 BPS).
341	I+19H56M	42	1. EXECUTE MINOR SEQUENCE *0552* (TRANSMITTER B HIGH POWER OFF).
342	I+19H57M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCES 0143 AND 0044 AND STATUS OF S/C RESPONSE.
343	I+20H	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0342 (START GYRO DRIFT CHECK).
344	I+20H0M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0342.
345		SP	1. CONTROL DSIF 42 EXECUTION OF MAJOR SEQUENCE 0342.
346	I+20H1M	42	1. EXECUTE MINOR SEQUENCE *0354* (INERTIAL MODE).
347	I+20H2M	SP	1. REPORT TO A COMPLETION OF MAJOR

## ITEM TIME OF EVENT STATION

## EVENT

347 (CONTINUED)

SEQUENCE 0342 AND STATUS OF  
S/C RESPONSE (NOTE - GYRO  
DRIFT CHECK IS COMPLETED AT  
I+24H).

348	I+20H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
349	I+21H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
350	I+22H	FP	1. REPORT TO A START OF FIRST POST- MIDCOURSE ORBIT DETERMINATION (94X).
351	I+22H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
352	I+23H23M	51	1. VISIBILITY BEGINS.
353	I+23H23M	NET	1. REPORT TO A START OF SEARCH FOR S/C BY DSIF 51.
354	I+23H24M	NET	1. REPORT TO A DETECTION OF S/C BY DSIF 51.
355	I+23H26M	NET	1. REPORT TO A DSIF 51 IN ONE-WAY LOCK WITH S/C.
356	I+23H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
357	I+24H	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0343 (TERMINATE GYRO DRIFT CHECK).
358	I+24H0M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0343.
359		SP	1. CONTROL DSIF 42 EXECUTION OF MAJOR SEQUENCE 0343.
360	I+24H1M	42	1. EXECUTE MINOR SEQUENCE *0357* (SUN ACQUISITION MODE ON).

ITEM	TIME OF EVENT	STATION	EVENT
361	I+24H3M	42	1. EXECUTE MINOR SEQUENCE *0655* (SUN AND STAR MODE).
362	I+24H5M	42	1. EXECUTE MINOR SEQUENCE *0054* (CRUISE MODE ON).
363	I+24H6M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0343 AND STATUS OF S/C RESPONSE.
364	I+24H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
365	I+24H40M	NET	1. REPORT TO A START OF STATION TRANSFER PROCEDURE.
366	I+24H45M	NET	1. REPORT TO A DSIF 42 TRANSMITTER OFF AND ONE-WAY LOCK WITH S/C.
367	I+24H46M	NET	1. REPORT TO A DSIF 51 IN TWO-WAY LOCK WITH S/C.
368	I+24H46M	51	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
369	I+25H	FP	1. REPORT TO A COMPLETION OF FIRST POSTMIDCOURSE ORBIT DETERMINATION. 2. BEGIN TRAJECTORY COMPUTATION (94X).
370	I+25H5M	FP	1. TRANSMIT PREDICTS TO DSIF 51, 11, 42.
371	I+25H10M	FP	1. COMPLETE TRAJECTORY COMPUTATION. 2. GENERATE TELECOMMUNICATIONS SAVE TAPE FOR SP.
372	I+25H15M	FP	1. BRIEF A ON FIRST POSTMIDCOURSE ORBIT.
373	I+25H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE, AND TELECOMMUNICATIONS PROGRAM RUN.
374	I+25H35M	SP	1. REPORT TO A DECISION TO EXECUTE

ITEM	TIME OF EVENT	STATION	EVENT
374	(CONTINUED)		MAJOR SEQUENCE 1340 (LOW-POWER INTERROGATION).
375	I+25H35M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 1340.
376		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCE 1340.
377	I+25H36M	51	1. EXECUTE MINOR SEQUENCE *0250* (COAST TO COMMUTATOR 4).
378	I+25H46M	51	1. EXECUTE MINOR SEQUENCE *0251* (COMMUTATOR 2 SELECTION).
379	I+25H56M	51	1. EXECUTE MINOR SEQUENCE *0252* (COMMUTATOR 1 SELECTION).
380	I+26H06M	51	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).
381	I+26H7M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 1340, AND STATUS OF S/C RESPONSE.
382	I+26H10M	SP	1. BRIEF A ON RESULTS OF TELE-COMMUNICATIONS PROGRAM RUN.
383	I+26H10M	NET	1. REPORT TO A START OF STATION TRANSFER PROCEDURE.
384	I+26H15M	NET	1. REPORT TO A DSIF 51 TRANSMITTER OFF AND ONE-WAY LOCK WITH S/C.
385	I+26H16M	NET	1. REPORT TO A DSIF 42 IN TWO-WAY LOCK WITH S/C.
386	I+26H16M	42	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
387	I+26H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
388	I+27H20M	NET	1. REPORT TO A START OF STATION TRANSFER PROCEDURE.

ITEM	TIME OF EVENT	STATION	EVENT
389	I+27H25M	NET	1. REPORT TO A DSIF 42 TRANSMITTER OFF AND S/C TRACKING STOPPED.
390	I+27H26M	NET	1. REPORT TO A DSIF 51 IN TWO-WAY LOCK WITH S/C.
391	I+27H26M	51	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
392	I+27H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
393	I+27H50M	42	1. VISIBILITY ENDS.
394	I+28H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
395	I+29H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
396	I+30H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
397	I+31H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
398	I+32H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
399	I+33H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
400	I+34H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
401	I+34H48M	11	1. VISIBILITY BEGINS.
402	I+34H48M	NET	1. REPORT TO A START OF SEARCH FOR S/C BY DSIF 11.
403	I+34H49M	NET	1. REPORT TO A DETECTION OF S/C BY DSIF 11.
404	I+34H50M	NET	1. REPORT TO A DSIF 11 IN ONE-WAY LOCK WITH S/C.

ITEM	TIME OF EVENT	STATION	EVENT
404	(CONTINUED)		2. REPORT TO A START OF STATION TRANSFER PROCEDURE.
405	I+34H55M	NET	1. REPORT TO A DSIF 42 TRANSMITTER OFF AND S/C TRACKING STOPPED.
406	I+34H56M	NET	1. REPORT TO A DSIF 11 IN TWO-WAY LOCK WITH S/C.
407	I+34H56M	11	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
408	I+35H15M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 1340 (LOW-POWER INTERROGATION).
409	I+35H15M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 1340.
410		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 1340.
411	I+35H16M	11	1. EXECUTE MINOR SEQUENCE *0250* (COAST TO COMMUTATOR 4).
412	I+35H19M	51	1. VISIBILITY ENDS.
413	I+35H26M	11	1. EXECUTE MINOR SEQUENCE *0251* (COMMUTATOR 2 SELECTION).
414	I+35H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
415	I+35H36M	11	1. EXECUTE MINOR SEQUENCE *0252* (COMMUTATOR 1 SELECTION).
416	I+35H46M	11	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).
417	I+35H47M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 1340 AND STATUS OF S/C RESPONSE.
418	I+36H	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0342 (START GYRO

ITEM	TIME OF EVENT	STATION	EVENT
418	(CONTINUED)		DRIFT CHECK).
419	I+36H0M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0342.
420		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0342.
421	I+36H1M	11	1. EXECUTE MINOR SEQUENCE *0354* (INERTIAL MODE).
422	I+36H2M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0342 AND STATUS OF S/C RESPONSE (NOTE - GYRO DRIFT CHECK IS COMPLETED AT I+39H).
423	I+36H30M	SP	1. REPORT TO A START OF POWER THERMAL PROGRAM UPDATE, AND POWER THERMAL PREDICTION COMPUTATION.
424	I+37H15M	SP	1. BRIEF A ON RESULTS OF POWER THERMAL PREDICTION COMPUTATION.
425	I+37H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
426	I+38H	FP	1. REPORT TO A START OF SECOND POST-MIDCOURSE ORBIT DETERMINATION (94X).
427	I+38H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
428	I+38H47M	42	1. VISIBILITY BEGINS.
429	I+38H47M	NET	1. REPORT TO A START OF SEARCH FOR S/C BY DSIF 42.
430	I+38H48M	NET	1. REPORT TO A DETECTION OF S/C BY DSIF 42.
431	I+38H50M	NET	1. REPORT TO A DSIF 42 IN ONE-WAY LOCK WITH S/C.
432	I+39H	SP	1. REPORT TO A DECISION TO EXECUTE

ITEM	TIME OF EVENT	STATION	EVENT
432	(CONTINUED)		MAJOR SEQUENCE 0343 (TERMINATE GYRO DRIFT CHECK).
433	I+39H0M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0343.
434		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0343.
435	I+39H1M	11	1. EXECUTE MINOR SEQUENCE *0053* (SUN ACQUISITION MODE).
436	I+39H3M	11	1. EXECUTE MINOR SEQUENCE *0655* (SUN AND STAR MODE).
437	I+39H5M	11	1. EXECUTE MINOR SEQUENCE *0054* (CRUISE MODE).
438	I+39H6M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0343 AND STATUS OF S/C RESPONSE.
439	I+39H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
440	I+40H	NET	1. REPORT TO A START OF STATION TRANSFER PROCEDURE.
441	I+40H5M	NET	1. REPORT TO A DSIF 11 TRANSMITTER OFF AND ONE-WAY LOCK WITH S/C.
442	I+40H6M	NET	1. REPORT TO A DSIF 42 IN TWO-WAY LOCK WITH S/C.
443	I+40H6M	42	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
444	I+40H30M	SP	1. REPORT TO A START OF POWER. THERMAL PROGRAM UPDATE.
445	I+41H	FP	1. REPORT TO A COMPLETION OF SECOND POSTMIDCOURSE ORBIT DETERMINATION. 2. BEGIN TRAJECTORY COMPUTATION (94X)

ITEM	TIME OF EVENT	STATION	EVENT
446	I+41H10M	FP	1. COMPLETE TRAJECTORY COMPUTATION. 2. REPORT TO A START OF PRELIMINARY TERMINAL MANEUVER COMPUTATIONS (94X).
447	I+41H25M	NET	1. REPORT TO A START OF STATION TRANSFER PROCEDURE.
448	I+41H30M	FP	1. REPORT TO A COMPLETION OF PRE- LIMINARY TERMINAL MANEUVER COMPUTATIONS.
449	I+41H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
450	I+41H30M	NET	1. REPORT TO A DSIF 42 TRANSMITTER OFF AND ONE-WAY LOCK WITH S/C.
451	I+41H31M	NET	1. REPORT TO A DSIF 11 IN TWO-WAY LOCK WITH S/C.
452	I+41H31M	11	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
453	I+42H	FP	1. GIVE PRELIMINARY TERMINAL MANEUVER DATA TO SP. 2. BRIEF A,SS ON RESULTS OF SECOND POSTMIDCOURSE ORBIT AND PRE- LIMINARY TERMINAL MANEUVER COMPUTATIONS.
454	I+42H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
455	I+42H45M	NET	1. REPORT TO A START OF STATION TRANSFER PROCEDURE.
456	I+42H50M	NET	1. REPORT TO A DSIF 11 TRANSMITTER OFF AND S/C TRACKING STOPPED.
457	I+42H51M	NET	1. REPORT TO A DSIF 42 IN TWO-WAY LOCK WITH S/C.

ITEM	TIME OF EVENT	STATION	EVENT
458	I+42H51M	42	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
459	I+43H25M	11	1. VISIBILITY ENDS.
460	I+43H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
461	I+44H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 1642 (AUXILIARY BATTERY MODE ON). (THIS IS AN ESTIMATED START TIME WHICH WILL IN FACT BE DETERMINED DURING THE MISSION FROM SPACE-CRAFT BEHAVIOR).
462	I+44H30M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 1642.
463		SP	1. CONTROL DSIF 42 EXECUTION OF MAJOR SEQUENCE 1642.
464	I+44H31M	42	1. EXECUTE MINOR SEQUENCE *2153* (AUXILIARY BATTERY MODE ON).
465	I+44H32M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 1642 AND STATUS OF S/C RESPONSE.
466	I+45H	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 1341 (VERNIER THERMAL CONTROL ON).
467	I+45H0M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MINOR SEQUENCE 1341.
468		SP	1. CONTROL DSIF 42 EXECUTION OF MAJOR SEQUENCE 1341.
469	I+45H1M	42	1. EXECUTE MINOR SEQUENCE *1350* (VERNIER THERMAL CONTROL ON).
470	I+45H2M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 1341 AND STATUS OF S/C

ITEM	TIME OF EVENT	STATION	EVENT
470	(CONTINUED)		RESPONSE.
471	I+45H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
472	I+46H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
473	I+47H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
474	I+47H34M	51	1. VISIBILITY BEGINS.
475	I+47H34M	NET	1. REPORT TO A START OF SEARCH FOR S/C BY DSIF 51.
476	I+47H35M	NET	1. REPORT TO A DETECTION OF S/C BY DSIF 51.
477	I+47H37M	NET	1. REPORT TO A DSIF 51 IN ONE-WAY LOCK WITH S/C.
478	I+48H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
479	I+48H50M	NET	1. REPORT TO A START OF STATION TRANSFER PROCEDURE.
480	I+48H55M	NET	1. REPORT TO A DSIF 42 TRANSMITTER OFF AND ONE-WAY LOCK WITH S/C.
481	I+48H56M	NET	1. REPORT TO A DSIF 51 IN TWO-WAY LOCK WITH S/C.
482	I+48H56M	51	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
483	I+49H	FP	1. REPORT TO A START OF THIRD POST-MIDCOURSE ORBIT DETERMINATION (94X).
484	I+49H	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 1340 (LOW-POWER INTERROGATION).

ITEM	TIME OF EVENT	STATION	EVENT
485	I+49H30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 1340.
486		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCE 1340.
487	I+49H1M	51	1. EXECUTE MINOR SEQUENCE *0250* (COAST TO COMMUTATOR 4).
488	I+49H11M	51	1. EXECUTE MINOR SEQUENCE *0251* (COMMUTATOR 2 SELECTION).
489	I+49H21M	51	1. EXECUTE MINOR SEQUENCE *0252* (COMMUTATOR 1 SELECTION).
490	I+49H31M	51	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).
491	I+49H32M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 1340, AND STATUS OF S/C RESPONSE.
492	I+49H35M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
493	I+50H10M	NET	1. REPORT TO A START OF STATION TRANSFER PROCEDURE.
494	I+50H15M	NET	1. REPORT TO A DSIF 51 TRANSMITTER OFF AND ONE-WAY LOCK WITH S/C.
495	I+50H16M	NET	1. REPORT TO A DSIF 42 IN TWO-WAY LOCK WITH S/C.
496	I+50H16M	42	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
497	I+50H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
498	I+51H30M	SP	1. REPORT TO A START OF POWER. THERMAL PROGRAM UPDATE.
499	I+51H30M	NET	1. REPORT TO A START OF STATION TRANSFER PROCEDURE.

ITEM	TIME OF EVENT	STATION	EVENT
500	I+51H35M	NET	1. REPORT TO A DSIF 42 TRANSMITTER OFF AND SPACECRAFT TRACKING STOPPED.
501	I+51H36M	NET	1. REPORT TO A DSIF 51 IN TWO-WAY LOCK WITH S/C.
502	I+51H36M	51	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
503	I+51H57M	42	1. VISIBILITY ENDS.
504	I+52H	FP	1. REPORT TO A COMPLETION OF THIRD POSTMIDCOURSE ORBIT DETERMINATION. 2. BEGIN TRAJECTORY COMPUTATION (94X).
505	I+52H10M	FP	1. COMPLETE TRAJECTORY COMPUTATION. 2. REPORT TO A START OF INTERMEDIATE TERMINAL MANEUVER COMPUTATIONS (94X).
506	I+52H30M	FP	1. REPORT TO A COMPLETION OF INTERMEDIATE TERMINAL MANEUVER COMPUTATIONS.
507	I+52H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
508	I+53H	FP	1. GIVE INTERMEDIATE TERMINAL MANEUVER DATA TO SP. 2. BRIEF A,SS ON RESULTS OF INTERMEDIATE TERMINAL MANEUVER COMPUTATIONS.
509	I+53H5M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0342 (START GYRO DRIFT CHECK).
510	I+53H5M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0342.

ITEM TIME OF EVENT STATION			EVENT
511		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCE 0342.
512	I+53H6M	51	1. EXECUTE MINOR SEQUENCE *0354* (INERTIAL MODE).
513	I+53H7M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0342 AND STATUS OF S/C RESPONSE (NOTE - GYRO DRIFT CHECK IS COMPLETED AT I+57H5M).
514	I+53H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
515	I+54H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
516	I+55H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
517	I+56H30M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
518	I+57H	FP	1. REPORT TO A START OF FOURTH POSTMIDCOURSE ORBIT DETERMINATION (94X, Y).
519	I+57H5M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0343 (TERMINATE GYRO DRIFT CHECK).
520	I+57H5M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0343.
521		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCE 0343.
522	I+57H6M	51	1. EXECUTE MINOR SEQUENCE *0357* (SUN ACQUISITION MODE).
523	I+57H8M	51	1. EXECUTE MINOR SEQUENCE *0655* (SUN AND STAR MODE).
524	I+57H10M	51	1. EXECUTE MINOR SEQUENCE *0054* (CRUISE MODE).

ITEM	TIME OF EVENT	STATION	EVENT
525	I+57H11M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0343.
526	I+57H40M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 1342 (SURVEY TV WARMUP ON).
527	I+57H40M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 1342.
528		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCE 1342.
529	I+57H41M	51	1. EXECUTE MINOR SEQUENCE *1351* (SURVEY TV WARMUP ON).
530	I+57H42M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 1342 AND STATUS OF S/C RESPONSE.
531	I+58H40M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 1343 (APPROACH TV WARMUP ON).
532	I+58H40M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 1343.
533		SP	1. CONTROL DSIF 51 EXECUTION OF MAJOR SEQUENCE 1343.
534	I+58H41M	51	1. EXECUTE MINOR SEQUENCE *1352* (APPROACH CAMERA WARMUP ON).
535	I+58H42M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 1343, AND STATUS OF S/C RESPONSE.
536	I+58H46M	11	1. VISIBILITY BEGINS.
537	I+58H46M	NET	1. REPORT TO A START OF SEARCH FOR S/C BY DSIF 11.
538	I+58H47M	NET	1. REPORT TO A DETECTION OF S/C BY DSIF 11.

ITEM	TIME OF EVENT	STATION	EVENT
539	I+58H49M	NET	1. REPORT TO A DSIF 11 IN ONE-WAY LOCK WITH S/C. 2. REPORT TO A START OF STATION TRANSFER PROCEDURE.
540	I+58H54M	NET	1. REPORT TO A DSIF 51 TRANSMITTER OFF AND S/C TRACKING STOPPED.
541	I+58H55M	NET	1. REPORT TO A DSIF 11 IN TWO-WAY LOCK WITH S/C.
542	I+58H55M	11	1. BEGIN TRANSMITTING TRACKING DATA TO SF.
543	I+59H28M	51	1. VISIBILITY ENDS.
544	I+59H30M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0247 (HIGH-POWER ENGINEERING INTERROGATION (B, 17.2/137.5 TO 1100 BPS)).
545	I+59H30M30S	A	1. DIRECT A TO CONTROL EXECUTION OF MAJOR SEQUENCE 0247.
546		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0247.
547	I+59H31M	11	1. EXECUTE MINOR SEQUENCE *0652* (TRANSMITTER B FILAMENT).
548	I+59H31M25S	11	1. EXECUTE MINOR SEQUENCE *0250* (COAST COMMUTATOR 4).
549	I+59H32M30S	11	1. EXECUTE MAJOR SEQUENCE *0653* (TRANSMITTER B HIGH POWER ON).
550	I+59H32M50S	11	1. EXECUTE MINOR SEQUENCE *0256* (17.2/137.5 TO 1100 BPS).
551	I+59H35M50S	11	1. EXECUTE MINOR SEQUENCE *0251* (COMMUTATOR 2 SELECTION).
552	I+59H38M20S	11	1. EXECUTE MINOR SEQUENCE *0252* (COMMUTATOR 1 SELECTION).

ITEM	TIME OF EVENT	STATION	EVENT
553	I+59H41M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0247, AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0547 (COAST PHASE PREPARATION (B, 17.2 BPS)).
554	I+59H41M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0547.
555		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0547.
556	I+59H42M	11	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).
557	I+59H43M	11	1. EXECUTE MINOR SEQUENCE *0153* (1100/4400 TO 17.2 BPS).
558	I+59H44M	11	1. EXECUTE MINOR SEQUENCE *0552* (TRANSMITTER B HIGH POWER OFF).
559	I+59H45M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0547 AND STATUS OF S/C RESPONSE.
560	I+60H	FP	1. REPORT TO A COMPLETION OF FOURTH POSTMIDCOURSE ORBIT DETERMINATION.  2. REPORT TO A START OF FINAL TERMINAL MANEUVER COMPUTATION (94X, Y).
561	I+60H15M	FP	1. REPORT TO A COMPLETION OF FINAL TERMINATION MANEUVER COMPUTATION.  2. BEGIN TRAJECTORY COMPUTATION (94X).
562	I+60H25M	FP	1. COMPLETE TRAJECTORY COMPUTATION.
563	I+60H25M	SP	1. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
564	I+60H30M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0247 (HIGH-POWER

ITEM	TIME OF EVENT	STATION	EVENT
564	(CONTINUED)		INTERROGATION (B, 17.2/137.5 TO 1100 BPS)).
565	I+60H30M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0247.
566		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0247.
567	I+60H31M	11	1. EXECUTE MINOR SEQUENCE *0652* (TRANSMITTER B FILAMENT).
568	I+60H31M25S	11	1. EXECUTE MINOR SEQUENCE *0250* (COAST TO COMMUTATOR 4).
569	I+60H32M30S	11	1. EXECUTE MINOR SEQUENCE *0653* (TRANSMITTER B HIGH POWER ON).
570	I+60H32M50S	11	1. EXECUTE MINOR SEQUENCE *0256* (17.2/137.5 TO 1100 BPS).
571	I+60H35M50S	11	1. EXECUTE MINOR SEQUENCE *0251* (COMMUTATOR 2 SELECTION).
572	I+60H38M20S	11	1. EXECUTE MINOR SEQUENCE *0252* (COMMUTATOR 1 SELECTION).
573	I+60H41M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0247, AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0341 (GYRO SPEED CHECK, 1100 BPS RETURN).
574	I+60H41M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0341.
575		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0341.
576	I+60H42M	11	1. EXECUTE MINOR SEQUENCE *0350* (HIGH BIT RATE SCO OFF/GYRO PROCESSING ON).

ITEM	TIME OF EVENT	STATION	EVENT
577	I+60H43M30S	11	1. EXECUTE MINOR SEQUENCE *0351* (NEXT GYRO).
578	I+60H44M30S	11	1. CONTINUE MINOR SEQUENCE *0351* (NEXT GYRO).
579	I+60H45M30S	11	1. CONTINUE MINOR SEQUENCE *0351* (NEXT GYRO).
580	I+60H46M30S	11	1. EXECUTE MINOR SEQUENCE *0353* (GYRO PROCESSING OFF/7.35 KC SCO ON).
581	I+60H47M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0341, AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0344 (VCXO CHECK).
582	I+60H47M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0344.
583		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0344.
584	I+60H48M	11	1. EXECUTE MINOR SEQUENCE *1050* (TRANSPONDER POWER OFF).
585	I+60H49M15S	11	1. EXECUTE MINOR SEQUENCE *0355* (NARROW-BAND VCXO OFF).
586	I+60H50M	FP	1. TERMINAL MANEUVER COMMAND DECISION 1.
587	I+60H50M30S	11	1. EXECUTE MINOR SEQUENCE *0356* (NARROW-BAND VCXO ON).
588	I+60H51M	11	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).
589	I+60H51M30S	11	1. EXECUTE MINOR SEQUENCE *1053* (TRANSPONDER B ON).
590	I+60H52M45S	11	1. EXECUTE MINOR SEQUENCE *1054* (TRANSPONDER A ON).

ITEM	TIME OF EVENT	STATION	EVENT
591	I+60H54M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0344 AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0143 (4400/1100 TO 17.2 BPS) AND 0044 (TRANSMITTER B HIGH POWER OFF).
592	I+60H54M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCES 0143 AND 0044.
593		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCES 0143 AND 0044.
594	I+60H55M	11	1. EXECUTE MINOR SEQUENCE *0153* (1100/4400 TO 17.2 BPS).
595	I+60H56M	11	1. EXECUTE MINOR SEQUENCE *0552* (TRANSMITTER B HIGH POWER OFF).
596	I+60H57M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCES 0143 AND 0044.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 1344 (TV VIDICON WARMUP ON).
597	I+60H57M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 1344.
598		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 1344.
599	I+60H58M	11	1. EXECUTE MINOR SEQUENCE *1357* (TV VIDICON WARMUP ON).
600	I+60H59M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 1344 AND STATUS OF S/C RESPONSE.
601	I+61H5M	SP	1. TERMINAL MANEUVER COMMAND DECISION II.
602	I+61H15M	SP	1. REPORT TO A COMPLETION OF TERMINAL MANEUVER COMMAND MESSAGE

ITEM	TIME OF EVENT	STATION	EVENT
602	(CONTINUED)		PREPARATION.
603	I+61H15M	SP,FP	1. START VALIDATION OF TERMINAL MANEUVER COMMAND MESSAGE.
604	I+61H20M	SP	1. SEND TO A TERMINAL MANEUVER COMMAND REQUEST.
605	I+61H22M	A	1. COMMAND DIRECTIVE - SEND TERMINAL MANEUVER COMMAND MESSAGE TO DSIF 11.
606	I+61H25M	11	1. COMMAND VERIFICATION - PLAY BACK TERMINAL MANEUVER COMMAND TAPE FOR VERIFICATION.
607	I+61H40M	SP	1. REPORT TO A COMPLETION OF TERMINAL MANEUVER COMMAND TAPE VERIFICATION. 2. REPORT TO A START OF POWER, THERMAL PROGRAM UPDATE.
608	R-59M	SP	1. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0247 (HIGH-POWER INTERROGATION (B, 17.2/137.5 TO 1100 BPS)).
609	R-58M30S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0247.
610		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0247.
611	R-58M	11	1. EXECUTE MINOR SEQUENCE *0652* (TRANSMITTER B FILAMENT).
612	R-57M35S	11	1. EXECUTE MINOR SEQUENCE *0250* (COAST TO COMMUTATOR 4).
613	R-56M30S	11	1. EXECUTE MINOR SEQUENCE *0653* (TRANSMITTER B HIGH POWER ON).
614	R-56M10S	11	1. EXECUTE MINOR SEQUENCE *0256* (17.2 /137.5 TO 1100 BPS).

ITEM	TIME OF EVENT	STATION	EVENT
615	R-53M15S	11	1. EXECUTE MINOR SEQUENCE *0251* (COMMUTATOR 2 SELECTION).
616	R-50M45S	11	1. EXECUTE MINOR SEQUENCE *0252* (COMMUTATOR 1 SELECTION).
617	R-48M15S	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0247 AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 0341 (GYRO SPEED CHECK, 1100 BPS RETURN).
618	R-47M45S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 0341.
619		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 0341.
620	R-47M15S	11	1. EXECUTE MINOR SEQUENCE *0350* (HIGH BIT RATE SCO OFF/GYRO PROCESSING ON).
621	R-45M50S	11	1. EXECUTE MINOR SEQUENCE *0351* (NEXT GYRO).
622	R-44M50S	11	1. CONTINUE MINOR SEQUENCE *0351* (NEXT GYRO).
623	R-43M50S	11	1. CONTINUE MINOR SEQUENCE *0351* (NEXT GYRO).
624	R-42M50S	11	1. EXECUTE MINOR SEQUENCE *0353* (GYRO PROCESSING OFF/7.35 KC SCO ON).
625	R-42M20S	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 0341 AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 1345 (PRE-TERMINAL MANEUVER PREPARATIONS).
626	R-41M50S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCE 1345.

ITEM	TIME OF EVENT	STATION	EVENT
627		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 1345.
628	R-41M20S	11	1. EXECUTE MINOR SEQUENCE *1751* (SURVEY CAMERA TEMPERATURE CONTROL OFF).
629	R-41M	11	1. EXECUTE MINOR SEQUENCE *1755* (ACCELEROMETER/STRAIN GAUGE POWER).
630	R-40M50S	11	1. EXECUTE MINOR SEQUENCE *0251* (COMMUTATOR 2 SELECTION).
631	R-40M5S	11	1. EXECUTE MINOR SEQUENCE *1354* (STEP POLAR AXIS PLUS).
632	R-35M25S	11	1. EXECUTE MINOR SEQUENCE *0252* (COMMUTATOR 1 SELECTION).
633	R-33M45S	SP	1. REPORT TO A COMPLETION OF EXECUTION OF MAJOR SEQUENCE 1345 AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCES 1144, 1145, 1147).
634	R-33M15S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCES 1144, 1145, 1147.
635		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 1144 (TERMINAL SUN AND ROLL).
636	R-32M45S	11	1. EXECUTE MINOR SEQUENCE *1154* (SUN AND ROLL PARAMETERS).
637	R-31M45S	11	1. EXECUTE MINOR SEQUENCE *1251* (SUN AND ROLL).
638	R-29M45S	11	1. EXECUTE MINOR SEQUENCE *1155* (YAW PARAMETERS).
639	R-28M45S	11	1. EXECUTE MINOR SEQUENCE *1253* (YAW).
640	R-24M15S	11	1. EXECUTE MINOR SEQUENCE *1157* (ROLL PARAMETERS).

ITEM	TIME OF EVENT	STATION	EVENT
641	R-23M15S	11	1. EXECUTE MINOR SEQUENCE *1257* (ROLL).
642	R-16M45S	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCES 1144, 1145, 1147 AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 1641 (PLANAR ARRAY TELE-COMMUNICATIONS PREPARATION/THRUST BIAS (TRANSMITTER B, FREQUENCY SUMMING AMPLIFIER B)), MAJOR SEQUENCE 1645 (FIRST APPROACH TV/RETRO SEQUENCE PREPARATION), AND MAJOR SEQUENCE 1741 (TERMINAL DESCENT (TRANSMITTER B, PHASE SUMMING AMPLIFIER B)).
643	R-16M15S	A	1. DIRECT SP TO CONTROL EXECUTION OF MAJOR SEQUENCES 1641, 1645, AND 1741.
644		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 1641.
645	R-15M45S	11	1. EXECUTE MINOR SEQUENCE *1652* (APPROACH CAMERA PREPARATION).
646	R-15M35S	11	1. EXECUTE MINOR SEQUENCE *1653* (APPROACH CAMERA POWER ON).
647	R-15M15S	11	1. EXECUTE MINOR SEQUENCE *1651* (TRANSMITTER B TO PLANAR ARRAY).
648	R-15M	11	1. EXECUTE MINOR SEQUENCE *1050* (TRANSPONDERS OFF).
649	R-14M30S	11	1. EXECUTE MINOR SEQUENCE *0355* (NARROW-BAND VCXO OFF).
650	R-14M	11	1. EXECUTE MINOR SEQUENCE *1453* (FREQUENCY SUMMING AMPLIFIER B ON).
651	R-13M10S	11	1. EXECUTE MINOR SEQUENCE *0253* (550/1100 TO 4400 BPS).
652	R-12M15S	11	1. EXECUTE MINOR SEQUENCE *0251*

ITEM TIME OF EVENT STATION			EVENT
652	(CONTINUED)		(COMMUTATOR 2 SELECTION).
653	R-11M30S	11	1. EXECUTE MINOR SEQUENCE *1654* (NOMINAL THRUST BIAS SELECTION) (IF REQUIRED).
654		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 1645.
655	R-10M50S	11	1. EXECUTE MINOR SEQUENCE *1655* (FORTY-PICTURE TV).
656	R-7M50S	11	1. EXECUTE MINOR SEQUENCE *1656* (TV/RETRO SEQUENCE DELAY QUANTITY).
657	R-6M55S	11	1. EXECUTE MINOR SEQUENCE *1657* (RETRO SEQUENCE MODE).
658		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 1741.
659	R-6M25S	11	1. EXECUTE MINOR SEQUENCE *1750* (TEN-PICTURE TV).
660	R-5M25S	11	1. EXECUTE MINOR SEQUENCE *1752* (VERNIER THERMAL CONTROL OFF).
661	R-4M55S	11	1. EXECUTE MINOR SEQUENCE *1753* (AMR POWER/RESET SET IV LATCH).
662	R-4M35S	11	1. EXECUTE MINOR SEQUENCE *1754* (THRUST PHASE POWER).
663	R-4M25S	11	1. EXECUTE MINOR SEQUENCE *1756* (THIRTY-PICTURE TV).
664	R-2M10S	11	1. EXECUTE MINOR SEQUENCE *1757* (BATTERY /POWER PREPARATIONS).
665	R-1M50S	11	1. EXECUTE MINOR SEQUENCE *2050* (TEN-PICTURE TV).
666	R-52S	11	1. EXECUTE MINOR SEQUENCE *2051* (AMR ENABLE).
667	R-42S	11	1. EXECUTE MINOR SEQUENCE *2052* (THREE-V-58

ITEM TIME OF EVENT STATION			EVENT
667	(CONTINUED)		PICTURE TV AND ACCELEROMETER CHANNELS ON).
668	R-10S	S/C	1. AMR TRIGGER.
669	R-1S	S/C	1. VERNIER ENGINES IGNITED.
670	R=0	S/C	1. MAIN RETRO IGNITION.
671	R+1S	S/C	1. DOPPLER AND ALTIMETER RADARS ON.
672	R+40S	S/C	1. MAIN RETRO BURNOUT. (3 1/2G). 2. INCREASE IN VERNIER THRUST OUTPUT. 3. RETRO EJECT SIGNAL.
673	R+42S	11	1. EXECUTE MINOR SEQUENCE *2055* (LAST TV).
674	R+48S	S/C	1. MAIN RETRO EJECT SIGNAL.
675	R+55S	11	1. EXECUTE MINOR SEQUENCE *2057* (TELECOMMUNICATIONS TRANSFER (TRANSMITTER B PHASE SUMMING AMPLIFIER B ON)).
676	R+1M35S	11	1. EXECUTE MINOR SEQUENCE *2152* (TOUCHDOWN STRAIN GAUGES ON).
677	R+1M35S	S/C	1. 1000-FOOT MARK.
678	R+1M55S	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 1741 AND STATUS OF S/C RESPONSE.
679	R+2M3S	S/C	1. 10 FT/SEC MARK.
680	R+2M11S	S/C	1. 13-FOOT MARK.
681	R+2M13S TD=0	S/C	1. TOUCHDOWN.
682		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 2240 (POSTLANDING POWER SHUTDOWN OPERATIONS).

ITEM	TIME OF EVENT	STATION	EVENT
683	TD+20S	11	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).
684	TD+50S	11	1. EXECUTE MINOR SEQUENCE *2250* (RADVS POWER OFF).
685	TD+1M10S	11	1. EXECUTE MINOR SEQUENCE *2251* (FLIGHT CONTROL POWER OFF).
686	TD+1M30S	11	1. EXECUTE MINOR SEQUENCE *2252* (APPROACH CAMERA OFF).
687	TD+1M40S	11	1. EXECUTE MINOR SEQUENCE *2253* (STRAIN GAUGE POWER OFF).
688	TD+1M50S	11	1. EXECUTE MINOR SEQUENCE *2257* (ACCELEROMETER AMPLIFIERS OFF).
689	TD+2M	11	1. EXECUTE MINOR SEQUENCE *2254* (LOCK LANDING GEAR).
690	TD+2M10S	11	1. EXECUTE MINOR SEQUENCE *2255* (HIGH-CURRENT MODE OFF).
691	TD+2M20S	11	1. EXECUTE MINOR SEQUENCE *2256* (DUMP HELIUM).
692		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 2340. (INITIAL POSTLANDING ENGINEERING ASSESSMENT).
693	TD+3M10S	11	1. EXECUTE MINOR SEQUENCE *1550* (A/D CONVERTER SWITCH 1 TO 2 (550 BPS)).
694	TD+3M25S	11	1. EXECUTE MINOR SEQUENCE *0255* (550 TO 1100 BPS).
695	TD+4M15S	11	1. EXECUTE MINOR SEQUENCE *2350* (SOLAR PANEL/PLANAR ARRAY POSITIONING TEST NO. 1).
696	TD+4M45S	11	1. EXECUTE MINOR SEQUENCE *0250* (COAST TO ENGINEERING COMMUTATOR NO. 4).

ITEM	TIME OF EVENT	STATION	EVENT
697	TD+5M15S	11	1. EXECUTE MINOR SEQUENCE *0650* (TRANSMITTER A FILAMENT POWER ON).
698	TD+5M25S	11	1. EXECUTE MINOR SEQUENCE *2354* (FRE- QUENCY SUMMING AMPLIFIER B ON).
699	TD+6M	11	1. EXECUTE MINOR SEQUENCE *1051* (SELECT OMNIANTENNA A).
700	TD+6M15S	11	1. EXECUTE MINOR SEQUENCE *2353* (TRANSMITTER B TO LOW POWER).
701	TD+6M30S	11	1. EXECUTE MINOR SEQUENCE *1651* (TRANSMITTER B TO PLANAR ARRAY).
702	TD+6M50S	11	1. EXECUTE MINOR SEQUENCE *2355* (TRANSMITTER A LOW POWER ON).
703	TD+7M50S	11	1. EXECUTE MINOR SEQUENCE *0651* (TRANSMITTER A HIGH POWER ON).
704	TD+8M5S	11	1. EXECUTE MINOR SEQUENCE *2356* (FREQUENCY SUMMING AMPLIFIER A ON).
705	TD+8M40S	11	1. EXECUTE MINOR SEQUENCE *1450* (PHASE SUMMING AMPLIFIER A ON).
706	TD+9M15S	11	1. EXECUTE MINOR SEQUENCE *2352* (SOLAR PANEL/PLANAR ARRAY POSITIONING TEST NO. 2).
707	TD+9M30S	11	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).
708	TD+10M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCES 2240 AND 2340 AND STATUS OF S/C RESPONSES.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCES 2441 (SOLAR PANEL SUN SEARCH WITH SUN INITIALLY BELOW SOLAR PANEL PLANE) AND 2642 (SOLAR PANEL FINE POSITIONING).
709	TD+10M30S	A	1. DIRECT SP TO CONTROL DSIF 11 EXECUTION

ITEM	TIME OF EVENT	STATION	EVENT
709	(CONTINUED)		OF MAJOR SEQUENCES 2441 AND 2642.
710		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 2441.
711	TD+11M	11	1. EXECUTE MAJOR SEQUENCE *2441*.
712		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 2642.
713	TD+21M	11	1. EXECUTE MAJOR SEQUENCE *2642*.
714	TD+25M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCES 2441 AND 2642 AND STATUS OF S/C RESPONSES.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 2341 (POSTLANDING ENGINEERING ASSESSMENT NO. 2).
715	TD+25M30S	A	1. DIRECT SP TO CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 2341.
716		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 2341.
717	TD+26M	11	1. EXECUTE MINOR SEQUENCE *2357* (BATTERY CHARGE REGULATOR TEST).
718	TD+26M40S	11	1. EXECUTE MINOR SEQUENCE *0252* (COMMUTATOR 1 SELECTION).
719	TD+27M45S	11	1. EXECUTE MINOR SEQUENCE *0251* (COMMUTATOR 2 SELECTION).
720	TD+28M50S	11	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).
721	TD+29M55S	11	1. EXECUTE MINOR SEQUENCE *0250* (COAST TO ENGINEERING COMMUTATOR 4).
722	TD+31M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 2341 AND STATUS OF S/C RESPONSES.

ITEM	TIME OF EVENT	STATION	EVENT
722	(CONTINUED)		2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 2442 (PLANAR ARRAY EARTH SEARCH) AND 2641 (PLANAR ARRAY FINE POSITIONING).
723	TD+31M30S	A	1. DIRECT SP TO CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCES 2442 AND 2641.
724		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 2442.
725	TD+32M	11	1. EXECUTE MAJOR SEQUENCE *2442*.
726		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 2641.
727	TD+49M	11	1. EXECUTE MAJOR SEQUENCE *2641*.
728	TD+52M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCES 2442 AND 2641 AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 2541 (INITIAL LOW POWER ENGINEERING INTERROGATION).
729	TD+52M30S	A	1. DIRECT SP TO CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 2541.
730		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 2541.
731	TD+53M	11	1. EXECUTE MINOR SEQUENCE *0550* (ENGINEERING TO COAST COMMUTATOR).
732	TD+55M30S	11	1. EXECUTE MINOR SEQUENCE *0250* (COAST TO ENGINEERING COMMUTATOR 4).
733	TD+58M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 2541 AND STATUS OF S/C RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCES 2640 (INITIAL SOLAR PANEL/ PLANAR ARRAY REPOSITIONING) AND

ITEM	TIME OF EVENT	STATION	EVENT
733	(CONTINUED)		2641 (PLANAR ARRAY FINE POSITIONING).
734	TD+58M40S	A	1. DIRECT SP TO CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCES 2640 AND 2641.
735		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 2640.
736	TD+59M	11	1. EXECUTE MAJOR SEQUENCE *2640*.
737		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 2641.
738	TD+1H3M	11	1. EXECUTE MAJOR SEQUENCE *2641*.
739	TD+1H5M	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCES 2640 AND 2641 AND STATUS OF SPACECRAFT RESPONSE.  2. REPORT TO A DECISION TO EXECUTE MAJOR SEQUENCE 2740 (S/C PREPARATION FOR TV OPERATIONS).
740	TD+1H5M30S	A	1. DIRECT SP TO CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 2740.
741		SP	1. CONTROL DSIF 11 EXECUTION OF MAJOR SEQUENCE 2740.
742	TD+1H6M	11	1. EXECUTE MINOR SEQUENCE *0650* (TRANS- MITTER A FILAMENT ON).
743	TD+1H7M30S	11	1. EXECUTE MINOR SEQUENCE *0651* (TRANSMITTER A HIGH POWER ON).
744	TD+1H7M50S	11	1. EXECUTE MINOR SEQUENCE 0253 (550/ 1100 TO 4400 BPS).
745	TD+1H8M45S	11	1. EXECUTE MINOR SEQUENCE 2750 (HIGH- POWER SURVEY TV PREPARATION).
746	TD+1H9M40S	SP	1. REPORT TO A COMPLETION OF MAJOR SEQUENCE 2740 AND STATUS OF S/C RESPONSE.

ITEM TIME OF EVENT STATION

EVENT

747 TD+1H10M

A

1. DIRECT SSAC TO PROCEED WITH SURVEY  
TV OPERATION.

### SUBSEQUENT LUNAR OPERATIONS

From this point SSAC will conduct television surveys as thermal constraints permit. The planned composition for the first five surveys is as follows:

- 1) First wide-angle TV mapping (6 minutes)
- 2) First narrow-angle TV mapping (25 minutes)
- 3) Second wide-angle TV mapping (21 minutes)
- 4) Second narrow-angle TV mapping (30 minutes)
- 5) Third narrow-angle TV mapping (10 minutes)

Television surveys will continue until the day/night terminator or until the TV camera, low-temperature, operating limit is reached.

Beginning at TD +1 hour 40 minutes, SPAC will conduct engineering interrogations of six-minute duration at thirty-minute intervals (Major Sequence 2542 or 2540). At twelve-hour intervals, more extensive interrogations of twelve-minute duration will be conducted (Major Sequence 2543). If thermal constraints permit, engineering data will be transmitted continuously when television is not operating.

The solar panel and planar array antenna will be repositioned at roughly 24-hour intervals to maintain their orientation toward the Sun and the Earth, respectively (Major Sequence 2643).

GLOSSARY OF COMMAND SEQUENCES REQUIRED  
DURING STANDARD SEQUENCE OF EVENTS

00. INITIAL OPERATIONS AND HIGH-POWER SWITCHING

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0040			<u>Initial Spacecraft Operations</u>
	0050		Accelerometer Amplifiers Off
		0623	1) Basic Bus Accelerometer Amplifiers Off
	0057		Solar Panel Deployment Logic Off
		0316	1) Solar Panel Deploy Logic Off
	0051		Coast to Commutator 1
		0510	1) Auxiliary Commutators Off
		0226	2) Engineering Commutator 1 On
	0052		Initial 4400 bps Selection
		0237	1) Low Modulation Index SCO Off
		0217	2) 33 kc SCO On
		0206	3) A/D Clock Rate 4400 bps
	0054		Cruise Mode
		0704	1) Cruise Mode On
	0055		Commutator 4 Selection
		0231	1) Engineering Commutator 4 On

## GLOSSARY (CONT'D)

## 00. INITIAL OPERATIONS AND HIGH-POWER SWITCHING (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0041	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	0056		Commutator 3 Selection
		0230	1) Engineering Commutator 3 On
	0550		Engineering to Coast Commutator
		0232	1) Engineering Commutators Off
		0506	2) Coast Phase Commutator On
			<u>Sun Acquisition</u>
	0053		Sun Acquisition
		0000	1) Zero Quantity
0043		0702	2) Sun Acquisition Mode On
	0054		Cruise Mode
		0704	1) Cruise Mode On
			<u>Transmitter A High Power Off</u>
0044	0551		Transmitter A High Power Off
		0110	1) Transmitter Filament Power Off
		0126	2) Transfer Switch A Low Power
			<u>Transmitter B High Power Off</u>
	0552		Transmitter B High Power Off

## GLOSSARY (CONT'D)

## 00. INITIAL OPERATIONS AND HIGH-POWER SWITCHING (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0045	0650	0110	1) Transmitter Filament Power Off
		0130	2) Transfer Switch B Low Power
			<u>Transmitter A High Power On</u>
			Transmitter A Filament On
		0102	1) Transmitter A Filament Power On
0046	0651		Transmitter A High Power On
		0125	1) Transfer Switch A High Power
		0103	2) Transmitter A High Voltage On
			<u>Transmitter B High Power On</u>
			Transmitter B Filament On
		0105	1) Transmitter B Filament Power On
	0653		Transmitter B High Power On
		0127	1) Transfer Switch B High Power
		0106	2) Transmitter B High Voltage On

## GLOSSARY (CONT'D)

## 01. BIT RATE REDUCTIONS

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0140	0150		<u>4400 to 1100 bps</u>
			4400 to 1100 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0216	2) 7.35 kc A/D SCO On
0141	0151	0205	3) A/D Clock Rate 1100 bps
			<u>4400/1100 to 550 bps</u>
			4400/1100 to 550 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off
0142	0152	0215	2) 3.9 kc A/D SCO On
		0204	3) A/D Coast Phase Clock Rates
			<u>4400/1100 to 137.5 bps</u>
			4400/1100 to 137.5 bps
0143	0153	0220	1) 33, 7.35, 3.9 kc SCOs Off
		0500	2) Coast Phase I A/D SCO On
		0204	3) A/D Coast Phase Clock Rates
		0504	4) A/D Clock Rate 137.5 bps
0143	0153		<u>4400/1100 to 17.2 bps</u>
			4400/1100 to 17.2 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off

## GLOSSARY (CONT'D)

## 01. BIT RATE REDUCTIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0144	0154	0501	2) Coast Phase II A/D SCO On
		0204	3) A/D Coast Phase Clock Rates
		0505	4) A/D Clock Rate 17.2 bps <u>550 to 137.5 bps</u>
			550 to 137.5 bps
0145	0155	0220	1) 33, 7.35, 3.9 kc SCOs Off
		0500	2) Coast Phase I A/D SCO On
		0204	3) A/D Coast Phase Clock Rates
		0504	4) A/D Clock Rate 137.5 bps <u>550 to 17.2 bps</u>
0146	0156		550 to 17.2 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0501	2) Coast Phase II A/D SCO On
		0204	3) A/D Coast Phase Clock Rates
		0505	4) A/D Clock Rate 17.2 bps <u>137.5 to 17.2 bps</u>
			137.5 to 17.2 bps

## GLOSSARY (CONT'D)

## 01. BIT RATE REDUCTIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
		0502	1) Coast Phase A/D SCOs Off
		0501	2) Coast Phase II A/D SCO On
		0505	3) A/D Clock Rate 17.2 bps

## GLOSSARY (CONT'D)

## 02. HIGH-POWER INTERROGATIONS

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0240			<u>High-Power Interrogation</u> <u>(A, 4400 from 1100/550)</u>
	0650		Transmitter A Filament
		0102	1) Transmitter A Filament Power On
	0250		Coast to Commutator Off
		0510	1) Auxiliary Commutator Off
		0231	2) Engineering Commutator 4 On
	0651		Transmitter A High Power On
		0125	1) Transfer Switch A High Power
		0103	2) Transmitter A High Voltage On
	0253		1100/550 to 4400 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0217	2) 33 kc A/D SCO On
		0206	3) A/D Clock Rate 4400 bps
	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	0252		Commutator 1 Selection
		0226	1) Engineering Commutator 1 On

## GLOSSARY (CONT'D)

## 02. HIGH-POWER INTERROGATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0241			<u>High-Power Interrogation</u> <u>(A, 4400 from 17.2/135.5)</u>
	0650		Transmitter A Filament
		0102	1) Transmitter A Filament Power On
	0250		Coast to Commutator 4
		0510	1) Auxiliary Commutator Off
		0231	2) Engineering Commutator 4 On
	0651		Transmitter A High Power On
		0125	1) Transfer Switch A High Power
		0103	2) Transmitter A High Voltage On
	0254		17.2/137.5 to 4400 bps
		0502	1) Coast Phase A/D SCOs Off
		0217	2) 33 kc A/D SCO On
		0206	3) A/D Clock Rate 4400 bps
	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	0252		Commutator 1 Selection
		0226	1) Engineering Commutator 1 On

## GLOSSARY (CONT'D)

## 02. HIGH-POWER INTERROGATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0242			<u>High-Power Interrogation</u> <u>(A, 1100 from 550)</u>
	0650		Transmitter A Filament
		0102	1) Transmitter A Filament Power On
	0250		Coast to Commutator 4
		0510	1) Auxiliary Commutator Off
		0231	2) Engineering Commutator 4 On
	0651		Transmitter A High Power On
		0125	1) Transfer Switch A High Power
		0103	2) Transmitter A High Voltage On
	0255		550 to 1100 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0216	2) 7.35 kc A/D SCO On
		0205	3) A/D Clock Rate 1100 bps
	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	0252		Commutator 1 Selection
		0226	1) Engineering Commutator 1 On

## GLOSSARY (CONT'D)

## 02. HIGH-POWER INTERROGATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0243			<u>High-Power Interrogation</u> <u>(A, 1100 from 17.2/137.5)</u>
	0650		Transmitter A Filament
		0102	1) Transmitter A Filament Power On
	0250		Coast to Commutator 4
		0510	1) Auxiliary Commutator Off
		0231	2) Engineering Commutator 4 On
	0651		Transmitter A High Power On
		0125	1) Transfer Switch A High Power
		0103	2) Transmitter A High Voltage On
	0256		17.2/137.5 to 1100 bps
		0502	1) Coast Phase A/D SCOs Off
		0216	2) 7.35 kc A/D SCO On
		0205	3) A/D Clock Rate 1100 bps
	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	0252		Commutator 1 Selection
		0226	1) Engineering Commutator 1 On

## GLOSSARY (CONT'D)

## 02. HIGH-POWER INTERROGATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0244			<u>High-Power Interrogation</u> <u>(B, 4400 from 1100/550)</u>
	0652		Transmitter B Filament
		0105	1) Transmitter B Filament Power On
	0250		Coast to Commutator 4
		0510	1) Auxiliary Commutator Off
		0231	2) Engineering Commutator 4 On
	0653		Transmitter B High Power On
		0127	1) Transfer Switch B High Power
		0106	2) Transmitter B High Voltage On
	0253		1100/550 to 4400 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0217	2) 33 kc A/D SCO On
		0206	3) A/D Clock Rate 4400 bps
	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	0252		Commutator 1 Selection
		0226	1) Engineering Commutator 1 On

## GLOSSARY (CONT'D)

## 02. HIGH-POWER INTERROGATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0245			<u>High-Power Interrogation</u> <u>(B, 4400 from 17.2/137.5)</u>
	0652		Transmitter B Filament
		0105	1) Transmitter B Filament Power On
	0250		Coast to Commutator 4
		0510	1) Auxiliary Commutator Off
		0231	2) Engineering Commutator 4 On
	0653		Transmitter B High Power On
		0127	1) Transfer Switch B High Power
		0106	2) Transmitter B High Voltage On
	0254		17.2/137.5 to 4400 bps
		0502	1) Coast Phase A/D SCOs Off
		0217	2) 33 kc A/D SCO On
		0206	3) A/D Clock Rate 4400 bps
	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	0252		Commutator 1 Selection
		0226	1) Engineering Commutator 1 On

## GLOSSARY (CONT'D)

## 02. HIGH-POWER INTERROGATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0246			<u>High-Power Interrogation</u> <u>(B, 1100 from 550)</u>
	0652		Transmitter B Filament
		0105	1) Transmitter B Filament Power On
	0250		Coast to Commutator 4
		0510	1) Auxiliary Commutator Off
		0231	2) Engineering Commutator 4 On
	0653		Transmitter B High Power On
		0127	1) Transfer Switch B High Power
		0106	2) Transmitter B High Voltage On
	0255		550 to 1100 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0216	2) 7.35 kc A/D SCO On
		0205	3) A/D Clock Rate 1100 bps
	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	0252		Commutator 1 Selection
		0226	1) Engineering Commutator 1 On

## GLOSSARY (CONT'D)

## 02. HIGH-POWER INTERROGATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0247			<u>High-Power Interrogation</u> <u>(B, 1100 from 17.2/137.5)</u>
	0652		Transmitter B Filament
		0105	1) Transmitter B Filament Power On
	0250		Coast to Commutator 4
		0510	1) Auxiliary Commutator Off
		0231	2) Engineering Commutator 4 On
	0653		Transmitter B High Power On
		0127	1) Transfer Switch B High Power
		0106	2) Transmitter B High Voltage On
	0256		17.2/137.5 to 1100 bps
		0502	1) Coast Phase A/D SCOs Off
		0216	2) 7.35 kc A/D SCO On
		0205	3) A/D Clock Rate 1100 bps
	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	0252		Commutator 1 Selection
		0226	1) Engineering Commutator 1 On

## GLOSSARY (CONT'D)

## 03. SPECIAL CHECKS

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0340			<u>Gyro Speed Check</u> <u>(4400 bps Return)</u>
	0350		High Bit Rate SCO Off/Gyro Processing On
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0221	2) Gyro Speed Signal Processing On
	0351		Next Gyro
		0222	1) Select Next Gyro Speed (3 Times)
	0352		Gyro Processing Off/33 kc SCO On
		0223	1) Gyro Speed Signal Processing Off
		0217	2) 33 kc A/D SCO On
			<u>Gyro Speed Check</u> <u>(1100 bps Return)</u>
0341	0350		High Bit Rate SCO Off/Gyro Processing On
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0221	2) Gyro Speed Signal Processing On
	0351		Next Gyro
		0222	1) Select Next Gyro Speed (3 Times)
	0353		Gyro Processing Off/7.35 kc SCO On

## GLOSSARY (CONT'D)

## 03. SPECIAL CHECKS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0342	0354	0223	1) Gyro Speed Signal Processing Off
		0216	2) 7.35 kc A/D SCO On
			<u>Start Gyro Drift Check</u>
0343	0357	0700	Inertial Mode
			1) Inertial Mode On
			<u>Terminate Gyro Drift Check</u>
0344	0655	0702	Sun Acquisition Mode
			1) Sun Acquisition Mode On
	0054	0703	Sun and Star Mode
			1) Sun and Star Acquisition Mode On
	0704		Cruise Mode
			1) Cruise Mode On
	1050		<u>VCXO/VCO Check</u>
			Transponder Power Off
	0355	0124	1) Transponder Power Off
			Narrow-Band VCXO Off
	0356	0113	1) Narrow-Band VCXO Off
			Narrow-Band VCXO On
		0112	1) Narrow-Band VCXO On

## GLOSSARY (CONT'D)

## 03. SPECIAL CHECKS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	0550		Engineering to Coast Commu- tator
		0232	1) Engineering Commutators Off
		0506	2) Coast Phase Commutator On
	1053		Transponder B On
		0123	1) Transponder B Power On
	1054		Transponder A On
		0122	1) Transponder A Power On

## GLOSSARY (CONT'D)

## 05. COAST PHASE PREPARATIONS

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0540	0550		<u>Coast Phase Preparation</u> <u>(A, 1100 bps)</u>
			Engineering to Coast Commu- tator
		0232	1) Engineering Commutator Off
		0506	2) Coast Phase Commutator On
	0150		4400/550 to 1100 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0216	2) 7.35 kc A/D SCO On
		0205	3) A/D Clock Rate 1100 bps
	0551		Transmitter A High Power Off
		0110	1) Transmitter Filament Power Off
0541	0550	0126	2) Transfer Switch A Low Power
			<u>Coast Phase Preparation</u> <u>(A, 550 bps)</u>
			Engineering to Coast Commu- tator
		0232	1) Engineering Coast Commu- tator
	0151	0506	2) Coast Phase Commutator On
			4400/1100 to 550 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off

## GLOSSARY (CONT'D)

## 05. COAST PHASE PREPARATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0542	0551	0215	2) 3.9 kc A/D SCO On
		0204	3) A/D Coast Phase Clock Rates
			Transmitter A High Power Off
		0110	1) Transmitter Filament Power Off
	0550	0126	2) Transfer Switch A Low Power
			<u>Coast Phase Preparation</u> <u>(A, 137.5 bps)</u>
			Engineering to Coast Commu- tator
		0232	1) Engineering Commutator Off
	0152	0506	2) Coast Phase Commutator On
			4400/1100 to 137.5 bps
		0220	1) 33, 7.35, 3.9 KC SCOs Off
		0500	2) Coast Phase I A/D SCO On
	0551	0204	3) A/D Coast Phase Clock Rates
		0504	4) A/D Clock Rate 137.5 bps
			Transmitter A High Power Off
		0110	1) Transmitter Filament Power Off
		0126	2) Transfer Switch A Low Power

## GLOSSARY (CONT'D)

## 05. COAST PHASE PREPARATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0543	0550		<u>Coast Phase Preparation</u> <u>(A, 17.2 bps)</u>
			Engineering to Coast Commu- tator
		0232	1) Engineering Commutator Off
		0506	2) Coast Phase Commutator On
	0153		4400/1100 to 17.2 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0501	2) Coast Phase II A/D SCO On
		0204	3) A/D Coast Phase Clock Rates
		0505	4) A/D Clock Rate 17.2 bps
	0551		Transmitter A High Power Off
		0110	1) Transmitter Filament Power Off
0544	0550	0126	2) Transfer Switch A Low Power
			<u>Coast Phase Preparation</u> <u>(B, 1100 bps)</u>
			Engineering to Coast Commu- tator
		0232	1) Engineering Commutator Off
		0506	2) Coast Phase Commutator On

## GLOSSARY (CONT'D)

## 05. COAST PHASE PREPARATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0545	0150		4400/550 to 1100 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0216	2) 7.35 kc A/D SCO On
		0205	3) A/D Clock Rate 1100 bps
	0552		Transmitter B High Power Off
		0110	1) Transmitter Filament Power Off
		0130	2) Transfer Switch B Low Power
			<u>Coast Phase Preparation</u> <u>(B, 550 bps)</u>
	0550		Engineering to Coast Commu- tator
		0232	1) Engineering Commutator Off
		0506	2) Coast Phase Commutator On
	0151		4400/1100 to 550 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0215	2) 3.9 kc A/D SCO On
		0204	3) A/D Coast Phase Clock Rates
	0552		Transmitter B High Power Off
		0110	1) Transmitter Filament Power Off
		0130	2) Transfer Switch B Low Power

## GLOSSARY (CONT'D)

## 05. COAST PHASE PREPARATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0546	0550		<u>Coast Phase Preparation</u> <u>(B, 137.5 bps)</u>
			Engineering to Coast Commu- tator
		0232	1) Engineering Commutator Off
		0506	2) Coast Phase Commutator On
		0152	4400/1100 to 137.5 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0500	2) Coast Phase I A/D SCO On
		0204	3) A/D Coast Phase Clock Rates
		0504	4) A/D Clock Rate 137.5 bps
		0552	Transmitter B High Power Off
0547	0550	0110	1) Transmitter Filament Power Off
		0130	2) Transfer Switch B Low Power
			<u>Coast Phase Preparation</u> <u>(B, 17.2 bps)</u>
			Engineering to Coast Commu- tator
		0232	1) Engineering Commutator Off
		0506	2) Coast Phase Commutator On

## GLOSSARY (CONT'D)

## 05. COAST PHASE PREPARATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	0153		4400/1100 to 17.2 bps
		0220	1) 33, 7.35, 3.9 kc A/D SCOs Off
		0501	2) Coast Phase II A/D SCO On
		0204	3) A/D Coast Phase Clock Rates
		0505	4) A/D Clock Rate 17.2 bps
	0552		Transmitter B High Power Off
		0110	1) Transmitter Filament Power Off
		0130	2) Transfer Switch B Low Power

## GLOSSARY (CONT'D)

## 06. STAR VERIFICATION/ACQUISITION

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0640			<u>Transmitter A Setup for Star Verification</u>
	0650		Transmitter A Filament
		0102	1) Transmitter A Filament Power On
	0051		Coast to Commutator 1
		0510	1) Auxiliary Commutators Off
		0226	2) Engineering Commutator 1 On
	0651		Transmitter A High Power On
		0125	1) Transfer Switch A High Power
		0103	2) Transmitter A High Voltage On
	0254		17.2, 137.5 to 4400 bps
		0502	1) Coast Phase A/D SCOs Off
		0217	2) 33 kc A/D SCO On
0641		0206	3) A/D Clock Rate 4400 bps
			<u>Transmitter B Setup for Star Verification</u>
	0652		Transmitter B Filament
		0105	1) Transmitter B Filament Power On

## GLOSSARY (CONT'D)

## 06. STAR VERIFICATION/ACQUISITION (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0642	0051		Coast to Commutator 1
		0510	1) Auxiliary Commutators Off
		0226	2) Engineering Commutator 1 On
	0653		Transmitter B High Power On
		0127	1) Transfer Switch B High Power
		0106	2) Transmitter B High Voltage On
	0254		17.2, 137.5 to 4400 bps
		0502	1) Coast Phase A/D SCOs Off
		0217	2) 33 kc A/D SCO On
		0206	3) A/D Clock Rate 4400 bps
			<u>Star Verification/Acquisition (Omni B)</u>
	1050		Transponders Off
		0124	1) Transponder Power Off
	0654		Flight Control Preparation
		0704	1) Cruise Mode On
		0715	2) Manual Delay Mode On
		0710	3) Positive Angle Maneuver
	1251		Sun and Roll
		0714	1) Sun and Roll

## GLOSSARY (CONT'D)

## 06. STAR VERIFICATION/ACQUISITION (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	1051		Select Omni A
		0120	1) Select Omnantenna A
	0655		Sun and Star Mode
		0703	1) Sun and Star Acquisition Mode On
	1052		Select Omni B
		0121	1) Select Omnantenna B
	0054		Cruise Mode
		0704	1) Cruise Mode On
	0550		Engineering to Coast Commu- tator
		0232	1) Engineering Commutators Off
		0506	2) Coast Phase Commutator On
	1053		Transponder B On
		0123	1) Transponder B Power On
	1054		Transponder A On
		0122	1) Transponder A Power On

## GLOSSARY (CONT'D)

## 07. MIDCOURSE OPERATIONS

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
0740	0750		<u>Vernier Pressurization</u>
			Vernier Pressurization
		3617	1) Interlock
0741	0751	0607	2) Pressurize Vernier System (Helium)
			<u>Midcourse Thrust Preparation</u>
			Propulsion Strain Gage Power/ Programmer Latch Reset
		0521	1) Propulsion Strain Gage Power On
	0752	0700	2) Inertial Mode On
		0720	3) Reset Set IV Outputs
			Thrust Phase Power
0742	0753	0727	1) Flight Control Thrust Phase Power On
	0754		Midcourse Thrust Quantity
		----	1) Quantity
			<u>Midcourse Thrust Execution</u>
			Thrust Execution
0743	0755	3617	1) Interlock
		0721	2) Midcourse Velocity Correction
			<u>Flight Control Thrust/Strain Gage Power Off</u>
			Flight Control Thrust/Strain Gage Power Off

## GLOSSARY (CONT'D)

## 07. MIDCOURSE OPERATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
		0737	1) Flight Control Thrust Phase Power Off
		0522	2) Propulsion Strain Gage Power Off

## GLOSSARY (CONT'D)

## 10. ATTITUDE MANEUVER PREPARATIONS

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1040			<u>Transponders Off</u>
	1050		Transponders Off
		0124	1) Transponder Power Off
1041			<u>Select Omni A</u>
	1051		Select Omni A
		0120	1) Select Omnantenna A
1042			<u>Select Omni B</u>
	1052		Select Omni B
		0121	1) Select Omnantenna B
1043			<u>Transponder B On</u>
	1053		Transponder B On
		0123	1) Transponder B Power On
1044			<u>Transponder A On</u>
	1054		Transponder A On
		0122	1) Transponder A Power On

## GLOSSARY (CONT'D)

## 11. PREMIDCOURSE AND TERMINAL ATTITUDE MANEUVERS

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1140	1150		<u>Premidcourse Sun and Roll</u>
			Sun and Roll Parameter
		0704	1) Cruise Mode On
		----	2) Quantity
	(0710)	3) Positive Angle Maneuver	
1141	1251		Sun and Roll
	1151	0714	1) Sun and Roll
			<u>Premidcourse Yaw</u>
			Yaw Parameters
		0704	1) Cruise Mode On
1142	1253	----	2) Quantity
		(0710)	3) Positive Angle Maneuver
			Yaw
		0713	1) Yaw
	1142	1152	
			Pitch Parameters
0704			1) Cruise Mode On
----			2) Quantity
(0710)		3) Positive Angle Maneuver	
1255		Pitch	
	0712	1) Pitch	

## GLOSSARY (CONT'D)

## 11. PREMIDCOURSE AND TERMINAL ATTITUDE MANEUVERS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1143	1153		<u>Premidcourse Roll</u>
			Roll Parameters
		0704	1) Cruise Mode On
		----	2) Quantity
		(0710)	3) Positive Angle Maneuver
1144	1257		Roll
		0711	1) Roll
			<u>Terminal Sun and Roll</u>
		1154	Sun and Roll Parameters
		0704	1) Cruise Mode On
1145	1251	----	2) Quantity
		(0710)	3) Positive Angle Maneuver
			Sun and Roll
		0714	1) Sun and Roll
			<u>Terminal Yaw</u>
1145	1155		Yaw Parameters
		0704	1) Cruise Mode On
		----	2) Quantity
		(0710)	3) Positive Angle Maneuver
		1253	Yaw
		0713	1) Yaw

## GLOSSARY (CONT'D)

## 11. PREMIDCOURSE AND TERMINAL ATTITUDE MANEUVERS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1146	1156		<u>Terminal Pitch</u>
			Pitch Parameters
		0704	1) Cruise Mode On
		----	2) Quantity
		(0710)	3) Positive Angle Maneuver
1147	1255		Pitch
		0712	1) Pitch
	1157		<u>Terminal Roll</u>
			Roll Parameters
		0700	1) Inertial Mode On
		----	2) Quantity
		(0710)	3) Positive Angle Maneuver
	1257		Roll
		0711	1) Roll
	0354		Inertial Mode
0700		1) Inertial Mode On	

## GLOSSARY (CONT'D)

## 12. POSTMIDCOURSE ATTITUDE MANEUVERS

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1240	1252		<u>Postmidcourse Yaw</u>
			Yaw Parameters
		0704	1) Cruise Mode On
		----	2) Quantity
	1253	(0710)	3) Positive Angle Maneuver
			Yaw
		0713	1) Yaw
			<u>Postmidcourse Pitch</u>
1241	1254		Pitch Parameters
		0704	1) Cruise Mode On
		----	2) Quantity
		(0710)	3) Positive Angle Maneuver
	1255		Pitch
		0712	1) Pitch
			<u>Postmidcourse Roll</u>
		1242	1256
0704	1) Cruise Mode On		
----	2) Quantity		
(0710)	3) Positive Angle Maneuver		
	1257		Roll
		0711	1) Roll

## GLOSSARY (CONT'D)

## 12. POSTMIDCOURSE ATTITUDE MANEUVERS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1243	0357	0702	<u>Sun Acquisition</u>
			Sun Acquisition Mode
1244	1250	----	1) Sun Acquisition Mode On
			<u>Postmidcourse Sun and Roll</u>
1245	1251	0714	Sun and Roll Parameters
			1) Quantity
1245	0655	0703	2) Positive Angle Maneuver
			Sun and Roll
1245	0054	0704	1) Sun and Roll
			<u>Sun and Star Acquisition/ Interrogation</u>
1245	0251	0227	Sun and Star Acquisition Mode
			1) Sun and Star Acquisition Mode On
1245	0055	0231	Cruise Mode
			1) Cruise Mode On
1245	0055	0231	Commutator 2 Selection
			1) Engineering Commutator 2 On
1245	0055	0231	Commutator 4 Selection
			1) Engineering Commutator 4 On

## GLOSSARY (CONT'D)

## 13. MISCELLANEOUS COAST PHASE OPERATIONS

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1340	0250		<u>Low-Power Interrogation</u>
			Coast to Commutator 4
		0510	1) Auxiliary Commutator Off
		0231	2) Engineering Commutator 4 On
	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	0252		Commutator 1 Selection
		0226	1) Engineering Commutator 1 On
	0550		Engineering to Coast Commutator
		0232	1) Engineering Commutator Off
		0506	2) Coast Phase Commutator On
1341	1350		<u>Vernier Thermal Control On</u>
			Vernier Thermal Control On
		0612	1) Vernier Fuel Tank No. 2 Thermal Control Power On
		0615	2) Vernier Oxidizer Tank No. 2 Thermal Control Power On
		0620	3) Vernier Oxidizer Tank No. 3 Thermal Control Power On

## GLOSSARY (CONT'D)

## 13. MISCELLANEOUS COAST PHASE OPERATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1342	1351	1136	<u>Survey TV Warmup On</u> Survey TV Warmup On 1) Electronics Temperature Control On, Survey Camera
1343	1352	0136	<u>Approach TV Warmup On</u> Approach Camera Warmup On 1) Electronics Temperature Control On, Approach Camera
1344	1357	1133	<u>TV Vidicon Warmup On</u> TV Vidicon Warmup On 1) Vidicon Temperature Control On, Survey Camera
		0131	2) Vidicon Temperature Control On, Approach Camera
1345	1755		<u>Pre-Terminal Maneuver Preparations</u> Accelerometer/Strain Gage Power
		0622	1) Basic Bus Accelerometer Amplifier On
		0511	2) Auxiliary Accelerometer Amplifier On
		0521	3) Propulsion Strain Gage Power On

## GLOSSARY (CONT'D)

## 13. MISCELLANEOUS COAST PHASE OPERATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	0251	0227	Commutator 2 Selection 1) Engineering Commutator 2 On
	1354	0403	Step Polar Axis Plus 1) Step Polar Axis Plus (N Times)
	0252	0226	Commutator 1 Selection 1) Engineering Commutator 1 On

## GLOSSARY (CONT'D)

## 14. A/B SUBSYSTEM SWITCHING

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1440	1450		<u>Phase Summing Amplifier A On</u>
			Phase Summing Amplifier A On
		0214	1) Summing Amplifiers Off
1441	1451	0210	2) Phase Summing Amplifier A On
		0207	3) Presumming Amplifier On
			<u>Phase Summing Amplifier B On</u>
1442	1452		Phase Summing Amplifier B On
		0214	1) Summing Amplifiers Off
		0211	2) Phase Summing Amplifier B On
1443	1453	0207	3) Presumming Amplifier On
			<u>Frequency Summing Amplifier A On</u>
			Frequency Summing Amplifier A On
1444	1454	0214	1) Summing Amplifiers Off
		0212	2) Frequency Summing Ampli- fier A On
			<u>Frequency Summing Amplifier B On</u>
1445	1455		Frequency Summing Amplifier B On

## GLOSSARY (CONT'D)

## 14. A/B SUBSYSTEM SWITCHING (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1444	1454	0214	1) Summing Amplifiers Off
		0213	2) Frequency Summing Amplifier B On
			<u>Transmitter A Low Power On</u>
			Transmitter A Low Power On
		0111	1) Transmitter Low Power Off
1445	1455	0101	2) Transmitter A Low Power On
		0112	3) Narrow-Band VCXO On
			<u>Transmitter B Low Power On</u>
			Transmitter B Low Power On
		0111	1) Transmitter Low Power Off
1446	1456	0104	2) Transmitter B Low Power On
		0112	3) Narrow-Band VCXO On
			<u>A/D Converter Switch</u> <u>(1 to 2, 4400 bps)</u>
			A/D Converter Switch (1 to 2, 4400 bps)
		0203	1) A/D Converter Power Off
		0202	2) A/D Converter No. 2 Power On
		0206	3) A/D Clock Rate 4400 bps

## GLOSSARY (CONT'D)

## 14. A/B SUBSYSTEM SWITCHING (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1447	1457		<u>A/D Converter Switch (1 to 2, 1100 bps)</u>
		0203	A/D Converter Switch (1 to 2, 1100 bps)
		0202	1) A/D Converter Power Off
		0205	2) A/D Converter No. 2 Power On
			3) A/D Clock Rate 1100 bps

## GLOSSARY (CONT'D)

## 15. A/B SUBSYSTEM SWITCHING

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1540	1550		<u>A/D Converter Switch</u> <u>(1 to 2, 550 bps)</u>
			A/D Converter Switch (1 to 2, 550 bps)
		0203	1) A/D Converter Power Off
		0202	2) A/D Converter No. 2 Power On
1541	1551		<u>A/D Converter Switch</u> <u>(1 to 2, 137.5 bps)</u>
			A/D Converter Switch (1 to 2, 137.5 bps)
		0203	1) A/D Converter Power Off
		0202	2) A/D Converter No. 2 Power On
		0504	3) A/D Clock Rate 137.5 bps
1542	1552		<u>A/D Converter Switch</u> <u>(1 to 2, 17.2 bps)</u>
			A/D Converter Switch (1 to 2, 17.2 bps)
		0203	1) A/D Converter Power Off
		0202	2) A/D Converter No. 2 Power On
		0505	3) A/D Clock Rate 17.2 bps
1543	1553		<u>A/D Converter Switch</u> <u>(2 to 1, 4400 bps)</u>
			A/D Converter Switch (2 to 1, 4400 bps)
		0203	1) A/D Converter Power Off

## GLOSSARY (CONT'D)

## 15. A/B SUBSYSTEM SWITCHING (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1544	1554	0201	2) A/D Converter No. 1 Power On
		0206	3) A/D Clock Rate 4400 bps  <u>A/D Converter Switch</u> <u>(2 to 1, 1100 bps)</u>
			A/D Converter Switch (2 to 1, 1100 bps)
1545	1555	0203	1) A/D Converter Power Off
		0201	2) A/D Converter No. 1 Power On
		0205	3) A/D Clock Rate 1100 bps  <u>A/D Converter Switch</u> <u>(2 to 1, 550 bps)</u>
1546	1556		A/D Converter Switch (2 to 1, 550 bps)
		0203	1) A/D Converter Power Off
		0201	2) A/D Converter No. 1 Power On
			<u>A/D Converter Switch</u> <u>(2 to 1, 137.5 bps)</u>
			A/D Converter Switch (2 to 1, 137.5 bps)
		0203	1) A/D Converter Power Off
		0201	2) A/D Converter No. 1 Power On
		0504	3) A/D Clock Rate 137.5 bps

## GLOSSARY (CONT'D)

## 15. S/B SUBSYSTEM SWITCHING (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1547	1557		<u>A/D Converter Switch</u> <u>(2 to 1, 17.2 bps)</u>
		0203	1) A/D Converter Power Off
		0201	2) A/D Converter No. 1 Power On
		0505	3) A/D Clock Rate 17.2 bps

## GLOSSARY (CONT'D)

## 16. TERMINAL DESCENT PREPARATIONS

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1640			<u>Planar Array Telecommuni-</u> <u>cations Preparation (Trans-</u> <u>mitter A, Frequency Summing</u> <u>Amplifier A/Thrust Bias</u>
	1652		Approach Camera Preparation
		0135	1) Temperature Control Off, Approach Camera
	1653		Approach Camera Power On
		0132	1) Power On, Approach Camera
	1650		Transmitter A to Planar Array
		0117	1) Transmitter A to Planar Array
	1050		Transponders Off
		0124	1) Transponder Power Off
	0355		Narrow-Band VCXO Off
		0113	1) Narrow-Band VCXO Off
	1452		Frequency Summing Amplifier A On
		0214	1) Summing Amplifiers Off
		0212	2) Frequency Summing Ampli- fier A On
	0253		550/1100 to 4400 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0217	2) 33 kc A/D SCO On
		0206	3) A/D Clock Rate 4400 bps

## GLOSSARY (CONT'D)

## 16. TERMINAL DESCENT PREPARATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1641	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	0642		Nominal Thrust Bias Selection
		(0722)	1) Select Nominal Thrust Bias
			<u>Planar Array Telecommunications Preparation (Transmitter B Frequency Summing Amplifier B)/Thrust Bias</u>
	1652		Approach Camera Preparation
		0135	1) Temperature Control Off, Approach Camera
	1653		Approach Camera Power On
		0132	1) Power On, Approach Camera
	1651		Transmitter B to Planar Array
		0146	1) Transmitter B to Planar Array
	1050		Transponders Off
		0124	1) Transponder Power Off
	0355		Narrow-Band VCXO Off
		0113	1) Narrow-Band VCXO Off
	1453		Frequency Summing Amplifier B On
		0214	1) Summing Amplifiers Off
		0213	2) Frequency Summing Amplifier B On

## GLOSSARY (CONT'D)

## 16. TERMINAL DESCENT PREPARATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1642	0253		550/1100 to 4400 bps
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0217	2) 33 kc A/D SCO On
		0206	3) A/D Clock Rate 4400 bps
	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	1654		Nominal Thrust Bias
		(0722)	1) Select Nominal Thrust Bias
			<u>Auxiliary Battery Mode On</u>
	2153		Auxiliary Battery Mode On
1643		0317	1) Auxiliary Battery Mode On
			<u>Restore Main Battery Mode</u>
1645	2154		Restore Main Battery Mode
		0320	1) Restore Main Battery Mode
			<u>First Approach TV/Retro Sequence Preparation</u>
	1655		Forty-Picture TV
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0133	2) Start Frame Approach Camera (40 Times, 4 Sec. Apart)
		0217	3) 33 kc A/D SCO On

## GLOSSARY (CONT'D)

## 16. TERMINAL DESCENT PREPARATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	1656	0700	Retro Sequence Delay Quantity
		----	1) Inertial Mode On
			2) Quantity
	1657		Retro Sequence Mode
		3617	1) Interlock
		0724	2) Retro Sequence Mode On

## GLOSSARY (CONT'D)

## 17. TERMINAL DESCENT

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1740	1750		<u>Terminal Descent (Transmitter A, Phase Summing Amplifier A)</u>
			Ten-Picture TV
		0220	1) 33, 7.35, 3.9 kc SCOs Off
	1752	0133	2) Start Frame Approach Camera (10 Times, 4 Sec. Apart)
		0217	3) 33 kc A/D SCO On
			Vernier Thermal Control Off
		0613	1) Vernier Lines No. 2 and Vernier Fuel Tank No. 2 Thermal Control Power Off
		0616	2) Vernier Lines No. 1 and Vernier Fuel Tank No. 2 Thermal Control Power Off
		0621	3) Vernier Lines No. 3 and Vernier Oxidizer Tank No. 3 Thermal Control Power Off
	1753		AMR Power/Reset Set IV Latch
		0625	1) Altitude Marking Radar Power On
		0720	2) Reset Set IV Outputs
	1754		Thrust Phase Power
		0727	1) Thrust Phase Power On

## GLOSSARY (CONT'D)

## 17. TERMINAL DESCENT (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	1756	0220	Thirty-Picture TV 1) 33, 7.35, 3.9 kc SCOs Off
		0133	2) Start Frame Approach Camera (30 Times, 4 Sec. Apart)
		0217	3) 33 kc A/D SCO On
	1757		Battery/Power Preparations
		0320	1) Restore Main Battery Mode
		0322	2) High-Current Mode On
	2050		Ten-Picture TV
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0133	2) Start Frame Approach Camera (10 Times, 4 Sec. Apart)
		0217	3) 33 kc A/D SCO On
	2051		AMR Enable
		0626	1) Enable Altitude Marking Radar
	2052		Three-Picture TV and Accelerometer Channels On
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0133	2) Start Frame Approach Camera (3 Times, 4 Sec. Apart)

## GLOSSARY (CONT'D)

## 17. TERMINAL DESCENT (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	2055	0217	3) 33 kc A/D SCO On
		0224	4) Basic Bus Accelerometer Channels On
		0513	5) Auxiliary Accelerometer Channels On
			Last TV
		0225	1) Basic Bus Accelerometer Channels Off
		0514	2) Auxiliary Accelerometer Data Channels Off
		0220	3) 33, 7.35, 3.9 kc SCOs Off
	2150	0133	4) Start Frame Approach Camera
		0217	5) 33 kc A/D SCO On
			Telecommunications Transfer (Transmitter A, Phase-Summing Amplifier A)
		0116	1) Transmitter B to Planar Array
		0112	2) Narrow-Band VCXO On
		0214	3) Summing Amplifiers Off
		0210	4) Phase-Summing Amplifier A On
		0220	5) 33, 7.35, 3.9 kc SCOs Off
		0215	6) 3.9 kc SCO On

## GLOSSARY (CONT'D)

## 17. TERMINAL DESCENT (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
1741	2152	0204	7) A/D Coast Phase Clock Rates 550 bps
		0230	8) Engineering Commutator 3 On
			Touchdown Strain Gages On
		0207	1) Presumming Amplifier On
		0515	2) Touchdown Strain Gage Power On
	1750	0517	3) Touchdown Strain Gage Data Channels On
			<u>Terminal Descent (Transmitter B, Phase-Summing Amplifier B)</u>
			Ten-Picture TV
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0133	2) Start Frame Approach Camera (10 Times, 4 Sec. Apart)
	1752	0217	3) 33 kc A/D SCO On
			Vernier Thermal Control Off
		0613	1) Vernier Lines No. 2 and Vernier Fuel Tank No. 2 Thermal Control Power Off
		0616	2) Vernier Lines No. 1 and Vernier Oxidizer Tank No. 2 Thermal Control Power Off
		0621	3) Vernier Lines No. 3 and Vernier Oxidizer Tank No. 3 Thermal Control Power Off

## GLOSSARY (CONT'D)

## 17. TERMINAL DESCENT (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	1753		AMR Power/Reset Set IV Latch
		0625	1) Altitude Marking Radar Power On
		0720	2) Reset Set IV Outputs
	1754		Thrust Phase Power
		0727	1) Thrust Phase Power On
	1756		Thirty-Picture TV
		0220	1) 33, 7. 35, 3. 9 kc SCOs Off
		0133	2) Start Frame Approach Camera (30 Times, 4 Sec. Apart)
		0217	3) 33 kc A/D SCO On
	1757		Battery/Power Preparations
		0320	1) Restore Main Battery Mode
		0322	2) High-Current Mode On
	2050		Ten-Picture TV
		0220	1) 33, 7. 35, 3. 9 kc SCOs Off
		0133	2) Start Frame Approach Camera (10 Times, 4 Sec. Apart)
		0217	3) 33 kc A/D SCO On
	2051		AMR Enable
		0626	1) Enable Altitude Marking Radar

## GLOSSARY (CONT'D)

## 17. TERMINAL DESCENT (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	2052		Three-Picture TV and Accelerometer Channels On
		0220	1) 33, 7.35, 3.9 kc SCOs Off
		0133	2) Start Frame Approach Camera (3 Times, 4 Sec. Apart)
		0217	3) 33 kc A/D SCO On
		0224	4) Basic Bus Accelerometer Channels On
		0513	5) Auxiliary Accelerometer Channels On
	2055		Last TV
		0225	1) Basic Bus Accelerometer Channels Off
		0514	2) Auxiliary Accelerometer Data Channels Off
		0220	3) 33, 7.35, 3.9 kc SCOs Off
		0133	4) Start Frame Approach Camera
		0217	5) 33 kc A/D SCO On
	2057		Telecommunications Transfer (Transmitter B, Phase-Summing Amplifier B)
		0117	1) Transmitter A to Planar Array
		0112	2) Narrow-Band VCXO On
		0214	3) Summing Amplifiers Off

## GLOSSARY (CONT'D)

## 17. TERMINAL DESCENT (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
		0211	4) Phase-Summing Amplifier B On
		0220	5) 33, 7. 35, 3. 9 kc SCOs Off
		0215	6) 3. 9 kc A/D SCO On
		0204	7) A/D Coast Phase Clock Rates 550 bps
		0230	8) Engineering Commutator 3 On
	2152		Touchdown Strain Gages On
		0207	1) Presumming Amplifier On
		0515	2) Touchdown Strain Gage Power On
		0517	3) Touchdown Strain Gage Data Channels On

## GLOSSARY (CONT'D)

## 22. POSTLANDING POWER SHUTDOWN OPERATIONS

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
2240	0550		<u>Postlanding Power Shutdown Operations</u>
			Engineering to Coast Commutator
		0232	1) Engineering Commutator Off
	2250	0506	2) Coast Phase Commutator On
			RADVS Power Off
		3617	1) Interlock
	2251	0630	2) RADVS Power Off
			Flight Control Power Off
		3617	1) Interlock
	2252	0311	2) All Flight Control Power Off
			Approach Camera Off
		0134	1) Power Off, Approach Camera
	2253		Strain Gage Power Off
		0516	1) Touchdown Strain Gage Power Off
		0520	2) Touchdown Strain Gage Data Channels Off
		0522	3) Propulsion Strain Gage Power Off

## GLOSSARY (CONT'D)

## 22. POSTLANDING POWER SHUTDOWN OPERATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	2257		Accelerometer Amplifiers Off
		0623	1) Basic Bus Accelerometer Amplifier Off
		0512	2) Auxiliary Accelerometer Amplifier Off
	2254		Lock Landing Gear
		0636	1) Lock Landing Gear
	2255		High-Current Mode Off
		0323	1) High-Current Mode Off
	2256		Dump Helium
		3617	1) Interlock
		0610	2) Dump Helium

## GLOSSARY (CONT'D)

## 23. POSTLANDING ENGINEERING ASSESSMENT

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
2340	1550		<u>Initial Postlanding Engineering Assessment</u>
			A/D Converter Switch 1 to 2 (550 bps)
		0203	1) A/D Converter Power Off
	0255	0202	2) A/D Converter No. 2 Power On
			550 to 1100 bps
		0220	1) A/D SCOs and Isolation Amplifier Off
	2350	0216	2) 7.35 kc A/D SCO On
		0205	3) A/D Clock Rate 1100 bps
			Solar Panel/Planar Array Positioning Test No. 1
		0632	1) Unlock Roll Axis
		0405	2) Step Roll Axis Plus (N Times)
		0635	3) Unlock Solar Panel Axis (Lunar)
		0401	4) Step Solar Panel Plus (N Times)
		0403	5) Step Polar Axis Plus (N Times)
	0250	0634	6) Unlock Elevation Axis
			Coast to Engineering Commutator 4
		0510	1) Auxiliary Commutators Off

## GLOSSARY (CONT'D)

## 23. POSTLANDING ENGINEERING ASSESSMENT (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
		0231	2) Engineering Commutator 4 On
	0650		Transmitter A Filament Power On
		0102	1) Transmitter A Filament Power On
	2354		Frequency-Summing Amplifier B On
		0214	1) Summing Amplifiers Off
		0113	2) Narrow-Band VCXO Off.
		0213	3) Frequency-Summing Amplifier B On
	1051		Select Omni A
		0120	1) Select Omnantenna A
	2353		Transmitter B to Low Power
		0107	1) Transmitter High Voltage Off
		0130	2) Transfer Switch B Low Power
	1651		Transmitter B to Planar Array
		0116	1) Transmitter B to Planar Array
	2355		Transmitter A Low Power On
		0111	1) Transmitter Low Power Off
		0101	2) Transmitter A Low Power On

## GLOSSARY (CONT'D)

## 23. POSTLANDING ENGINEERING ASSESSMENT (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	0651		Transmitter A High Power On
		0125	1) Transfer Switch A High Power
		0103	2) Transmitter A High Voltage On
	1452		Frequency-Summing Amplifier A On
		0214	1) Summing Amplifiers Off
		0212	2) Frequency-Summing Amplifier A On
	2356		Phase-Summing Amplifier A On
		0214	1) Summing Amplifiers Off
		0113	2) Narrow-Band VCXO Off
		0210	3) Phase-Summing Amplifier A On
		0207	4) Presumming Amplifier On
	2352		Solar Panel/Planar Array Positioning Test No. 2
		0407	1) Step Elevation Axis Plus (N Times)
		0406	2) Step Roll Axis Minus (N Times)
		0402	3) Step Solar Panel Axis Minus (N Times)
		0403	4) Step Polar Axis Minus (N Times)
		0410	5) Step Elevation Axis Minus (N Times)

## GLOSSARY (CONT'D)

## 23. POSTLANDING ENGINEERING ASSESSMENT (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
2341	0550		Engineering to Coast Commu- tator
		0232	1) Engineering Commutators Off
		0506	2) Coast Phase Commutator On
			<u>Postlanding Engineering Assess- ment No. 2</u>
	2357		Battery Charge Regulator Test
		0310	1) OCR Off
		0307	2) OCR Bypass On and OCR Off
		0306	3) OCR On and Bypass Off
	0252		Commutator 1 Selection
		0226	1) Engineering Commutator 1 On
	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	0550		Engineering to Coast Commu- tator
		0232	1) Engineering Commutator Off
		0506	2) Coast Phase Commutator On

## GLOSSARY (CONT'D)

## 23. POSTLANDING ENGINEERING ASSESSMENT (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	0250		Coast to Engineering Commu- tator 4
		0510	1) Auxiliary Commutators Off
		0231	2) Engineering Commutator 4 On

## GLOSSARY (CONT'D)

## 24. SOLAR PANEL SUN SEARCH/PLANAR ARRAY EARTH SEARCH

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
2441			<u>Solar Panel Sun Search with Sun Initially Below Solar Panel Plane</u>
	2450		Step Solar Panel Plus
		0401	1) Step Solar Panel Plus (N Times)
	2451		Step Solar Panel Minus
		0402	1) Step Solar Panel Minus (N Times)
	2452		Step Roll Axis Plus
		0405	1) Step Roll Axis Plus (N Times)
	2453		Step Roll Axis Minus
		0406	1) Step Roll Axis Minus (N Times)
	2351		Coast to Commutator 2
2442		0510	1) Auxiliary Commutator Off
		0227	2) Engineering Commutator 2 On
			<u>Planar Array Earth Search</u>
	2456		Transmitter A High Power Off
		0107	1) Transmitter High Voltage Off
		0126	2) Transfer Switch A Low Power

## GLOSSARY (CONT'D)

24. SOLAR PANEL SUN SEARCH/PLANAR ARRAY  
EARTH SEARCH (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	1650		Transmitter A to Planar Array
		0117	1) Transmitter A to Planar Array
	2454		Step Polar Axis Plus
		0403	1) Step Polar Axis Plus (N Times)
	2452		Step Roll Axis Plus
		0405	1) Step Roll Axis Plus (N Times)
	2455		Step Polar Axis Minus
		0404	1) Step Polar Axis Minus (N Times)
	2453		Step Roll Axis Minus
		0406	1) Step Roll Axis Minus (N Times)
	1651		Transmitter B to Planar Array
		0116	1) Transmitter B to Planar Array
	0651		Transmitter A High Power On
		0125	1) Transfer Switch A High Power
		0103	2) Transmitter A High Voltage On

Minor sequences from 2456 to 0651 repeated for each series positioning increments requiring position verification until Earth is acquired. In the final positioning increment Minor Sequences 1651 and 0651 may be replaced by 0551.

## GLOSSARY (CONT'D)

24. SOLAR PANEL SUN SEARCH/PLANAR ARRAY  
EARTH SEARCH (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	0551	0110	Transmitter A High Power Off
		0126	1) Transmitter Filament Power Off
			2) Transfer Switch A Low Power

## GLOSSARY (CONT'D)

## 25. LOW-POWER ENGINEERING INTERROGATION, LUNAR

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
2540	0055	0231	<u>Commutator 4 Selection</u> Commutator 4 Selection 1) Engineering Commutator 4 On
2541	0550	0232	<u>Initial Low-Power Engineering Interrogation, Lunar</u> Engineering to Coast Commutator 1) Engineering Commutator Off
		0506	2) Coast Phase Commutator On
	0250		Coast to Engineering Commutator 4
		0510	1) Auxiliary Commutators Off
		0231	2) Engineering Commutator 4 On
2542	2552		<u>TV Operation to Engineering Interrogation</u> Post TV Preparations
		0126	1) Transfer Switch A to Low Power
		0112	2) Narrow-Band VCXO On
		0215	3) 3.9 kc A/D SCO On
		0204	4) Coast Phase Bit Rates
		0210	5) Phase-Summing Amplifier A On

## GLOSSARY (CONT'D)

## 25. LOW-POWER ENGINEERING INTERROGATION, LUNAR (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
2543		0231	6) Engineering Commutator 4 On
		0110	7) Filament Power Off
			<u>Major Low-Power Engineering Interrogation, Lunar (Engineer- ing Commutator 4 On)</u>
	0252		Commutator 1 Selection
		0226	1) Engineering Commutator 1 On
	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	0550		Engineering to Coast Commu- tator
		0232	1) Engineering Commutator Off
		0506	2) Coast Phase Commutator On

## GLOSSARY (CONT'D)

## 26. SOLAR PANEL/PLANAR ARRAY REPOSITIONING

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
2640			<u>Initial Solar Panel/Planar Array Repositioning</u>
	2450		Step Solar Panel Plus
		0401	1) Step Solar Panel Plus (N Times)
	2451		Step Solar Panel Minus
		0402	1) Step Solar Panel Minus (N Times)
	2454		Step Polar Axis Plus
		0403	1) Step Polar Axis Plus (N Times)
	2455		Step Polar Axis Minus
		0404	1) Step Polar Axis Minus (N Times)
	2452		Step Roll Axis Plus
		0405	1) Step Roll Axis Plus (N Times)
	2453		Step Roll Axis Minus
		0406	1) Step Roll Axis Minus (N Times)
	2456		Step Elevation Axis Plus
		0407	1) Step Elevation Axis Plus (N Times)
	2457		Step Elevation Axis Minus
		0410	1) Step Elevation Axis Minus (N Times)

## GLOSSARY (CONT'D)

## 26. SOLAR PANEL/PLANAR ARRAY REPOSITIONING (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
2641			<u>Planar Array Fine Positioning</u>
	2450		Step Solar Panel Plus
		0401	1) Step Solar Panel Plus (N Times)
	2451		Step Solar Panel Minus
		0402	1) Step Solar Panel Minus (N Times)
	2454		Step Polar Axis Plus
		0403	1) Step Polar Axis Plus (N Times)
	2455		Step Polar Axis Minus
		0404	1) Step Polar Axis Minus (N Times)
	2452		Step Roll Axis Plus
		0405	1) Step Roll Axis Plus (N Times)
	2453		Step Roll Axis Minus
		0406	1) Step Roll Axis Minus (N Times)
	2456		Step Elevation Axis Plus
		0407	1) Step Elevation Axis Plus (N Times)
	2457		Step Elevation Axis Minus
		0410	1) Step Elevation Axis Minus (N Times)

## GLOSSARY (CONT'D)

## 26. SOLAR PANEL/PLANAR ARRAY REPOSITIONING (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
2642			<u>Solar Panel Fine Positioning</u>
	2450		Step Solar Panel Plus
		0401	1) Step Solar Panel Plus (N Times)
	2451		Step Solar Panel Minus
		0402	1) Step Solar Panel Minus (N Times)
	2454		Step Polar Axis Plus
		0403	1) Step Polar Axis Plus (N Times)
	2455		Step Polar Axis Minus
		0404	1) Step Polar Axis Minus (N Times)
	2452		Step Roll Axis Plus
		0405	1) Step Roll Axis Plus (N Times)
	2453		Step Roll Axis Minus
		0406	1) Step Roll Axis Minus (N Times)
	2456		Step Elevation Axis Plus
		0407	1) Step Elevation Axis Plus (N Times)
	2457		Step Elevation Axis Minus
		0410	1) Step Elevation Axis Minus (N Times)

## GLOSSARY (CONT'D)

## 26. SOLAR PANEL/PLANAR ARRAY REPOSITIONING (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
2643	0055		Commutator 4 Selection
		0231	1) Engineering Commutator 4 On
			<u>Periodic Planar Array/Solar Panel Repositioning Sequence</u> <u>No. N (Engineering Commutator 4 On)</u>
	2450		Step Solar Panel Plus
		0401	1) Step Solar Panel Plus (N Times)
	2451		Step Solar Panel Minus
		0402	1) Step Solar Panel Minus (N Times)
	2454		Step Polar Axis Plus
		0403	1) Step Polar Axis Plus (N Times)
	2455		Step Polar Axis Minus
		0404	1) Step Polar Axis Minus (N Times)
	2452		Step Roll Axis Plus
		0405	1) Step Roll Axis Plus (N Times)
	2453		Step Roll Axis Minus
		0406	1) Step Roll Axis Minus (N Times)
	2456		Step Elevation Axis Plus
		0407	1) Step Elevation Axis Plus (N Times)

## GLOSSARY (CONT'D)

## 26. SOLAR PANEL/PLANAR ARRAY REPOSITIONING (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
	2457		Step Elevation Axis Minus
		0410	1) Step Elevation Axis Minus (N Times)
	0252		Commutator 1 Selection
		0226	1) Engineering Commutator 1 On
	0251		Commutator 2 Selection
		0227	1) Engineering Commutator 2 On
	0550		Engineering to Coast Commu- tator
		0232	1) Engineering Commutator Off
		0506	2) Coast Phase Commutator On

## GLOSSARY (CONT'D)

27. SPACECRAFT SIGNAL PROCESSING AND DATA LINK  
OPERATIONS, SCIENTIFIC EXPERIMENT SUPPORT

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
2740	0650		<u>Spacecraft Preparation for Television Camera Operation</u>
			Transmitter A Filament On
		0102	1) Transmitter A Filament Power On
	0651		Transmitter A High Power On
		0125	1) Transfer Switch A High Power
		0103	2) Transmitter A High Voltage On
	0253		550/1100 to 4400 bps
		0220	1) A/D SCOs and Isolation Amps Off
		0217	2) 33 kc A/D SCO On
		0206	3) A/D Clock Rate 4400 bps
	2750		High-Power Survey TV Prepa- ration
		0113	1) Narrow-Band VCXO Off
		0232	2) Engineering Commutators Off
		0220	3) A/D SCOs and Isolation Amps Off
		0214	4) Summing Amplifiers Off
		0107	5) Transmitter High Voltage Off

## GLOSSARY (CONT'D)

## 30. SPACECRAFT POWER AND THERMAL CONTROL OPERATIONS

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
3040	3050		<u>Low-Power Engineering Interrogation to Standby Mode, OCR Off</u>
			Optimum Charge Regulator Off
	3051	0310	1) OCR Off
			Signal Processing and Data Link Off
		0232	1) Engineering Commutators Off
		0203	2) A/D Converter Power Off
		0214	3) Summing Amplifiers Off
		0220	4) A/D SCOs and Isolation Amplifier Off
		0111	5) Transmitter Low Power Off
			(Fill-in word transmission interrupted. )
3041	3052		<u>Standby Mode, OCR Off to Low-Power Engineering Interrogation</u>
			(Initiate fill-in word transmission. )
			Data Link and Signal Processing On
		0101	1) Transmitter A Low Power On
		0112	2) Narrow-Band VCXO On
		0210	3) Phase-Summing Amplifier A On

## GLOSSARY (CONT'D)

30. SPACECRAFT POWER AND THERMAL  
CONTROL OPERATIONS (CONT'D)

MAJOR SEQUENCE	MINOR SEQUENCE	COMMANDS	DESCRIPTION
3042		0215	4) 3.9 kc A/D SCO On
		0202	5) A/D Converter No. 2 Power On
		0204	6) A/D Coast Phase Clock Rates
		0503	7) A/D Clock Rate 550 bps
		0231	8) Engineering Commutator 4 On
	3053		Optimum Charge Regulator On
	3054	0306	1) Optimum Charge Regulator On and By-Pass Off
			<u>Compartment Heaters On, Automatic</u>
			Compartment Heaters On, Automatic
		0412	1) Compartment A Thermal Control Automatic
		0415	2) Compartment B Thermal Control Automatic

## SECTION VI

## NONSTANDARD OPERATIONS

## A. GENERAL

Section V presents, on a certain prescribed level, the normal, or standard, sequence of events. It is recognized that deviations from this standard will occur; therefore, every effort must be made to define various failure modes in anticipation of such events.

## B. NONSTANDARD PROCEDURE DEVELOPMENT

The nonstandard situations which may arise during the course of a mission can be classified as:

Prepared

Corrective action will be available.

Nonprepared

Corrective action will be determined at the time these situations are encountered.

A further breakdown of the categories may be given in which the degree of criticalness of time is considered.

Class A - Nonstandard, prepared, noncritical

Class B - Nonstandard, prepared, critical

Class C - Nonstandard, nonprepared, noncritical

Class D - Nonstandard, nonprepared, critical

The number of combinations of failures which may occur within the above classification is practically limitless. As a result, development of nonstandard sequences is restricted to those cases where only single failures exist and telemetry is assumed to be operating normally. Exhaustive analysis of such anticipated situations, taking into consideration the probability of occurrence, etc., has resulted in a limited set of situations which have been studied further. Fault isolation trees, listed in Table VI-I, have been devised for these situations. The trees are identified by the numbers 1 through 31 and are referred to as Nonstandard Procedures (NSPs).

These NSPs will be published separately but will be controlled by reference in this section of this document.

TABLE VI-I. FAULT ISOLATION TREES

IDENTIFICATION NUMBER	DESCRIPTION TITLE
1	Landing gear mechanism; omnidirectional antenna mechanism/electrical
3	Centaur separation
4	Flight control coast phase
5	Coast phase roll control
6	Flight control programmer
7	One-way DSIF spacecraft acquisition
8	Two-way DSIF spacecraft acquisition/T/M lockup
9	Solar panel positioning
10	Conservation of battery energy
11	Solar panel not in transit position
12	Sun acquisition
13	Solar panel electrical
14	Star acquisition
15	Planar array as roll attitude reference
16	Prethrust attitude maneuver
17	Flight control thrust phase
18	Loss of capability to soft-land
19	Loss of capability to hit Moon
20	Standard attitude maneuver
21	Engineering interrogation
23	Thermal management
24	Preretro attitude maneuver and descent TV
25	Terminal descent
27	Large injection errors
29	Loss of signal from the spacecraft
31	Power

### C. USE OF FAULT ISOLATION TREES

The Nonstandard Procedures are to serve as the mechanism of operations control during the analysis of spacecraft failures, within the limitations imposed by the assumption of single faults. SPAC has the primary responsibility for the required interpretation of spacecraft data and determination of command decisions. If the single fault limitation does not hold, SPAC may intermesh certain applicable trees, and use any additional techniques necessary to isolate the faults in order to arrive at a satisfactory recommended course of action. The DSIF will use preprepared command tapes according to Detailed Operating Procedures (DOPs), where necessary, in support of SPAC, as directed by Mission Control.

When deviations from the standard sequence occur and anticipated non-standard procedures exist, the SFOD will direct SPAC to proceed in accordance with the applicable fault isolation tree. It should be noted that command sequences are identified by the sequence number associated with the commands on the non-standard command tape.

Branch choice within a tree is determined by the conditions existing as a result of the fault and as indicated by the current spacecraft telemetry. All trees are developed so that return to the Standard Sequence of Events may be accomplished within a minimum time.

### D. GENERAL NONSTANDARD OPERATIONS PROCEDURES

The execution of commands required in nonstandard spacecraft situations will generally be implemented through one of the Command System Alternatives described in Section IV.

For nonstandard Classes A and B, above, the required spacecraft commands will be grouped on preprepared CDC command tapes at the DSIF. Execution of commands in these situations will be according to Alternative No. 1.

For nonstandard Class C, the required commands can be formulated at the SFOF manually, or by means of the SCP/CVT program, and transmitted to the DSIF via TTY (Command System Alternative No. 2).

Execution of commands in nonstandard Class D (Nonprepared, Time Critical) will be negotiated within the framework of Alternative No. 3. Commands will be entered on the CDC keyboard, as directed, by voice from the SFOF.

12/7/64

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